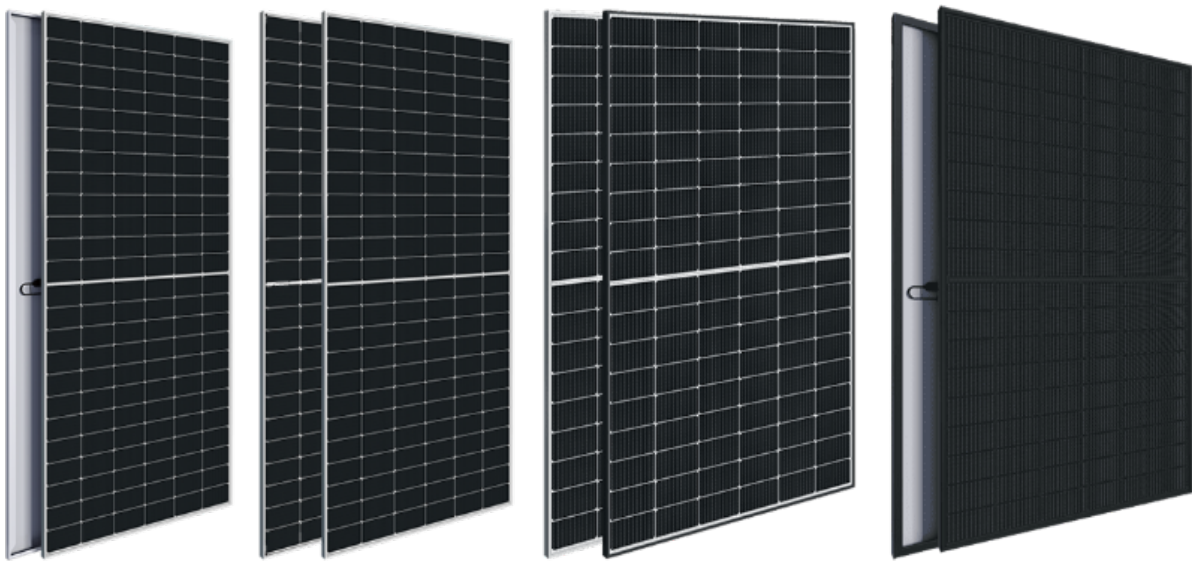


Environmental Product Declaration

In accordance with ISO14025:2006 and EN15804:2012+A2:2019/AC: 2021

ASTRONERGY MONOCRYSTALLINE PHOTOVOLTAIC MODULES



ASTRONERGY

The Norwegian
EPD Foundation

Owner of the declaration:
Chint New Energy Technology Co., Ltd.

Product name:
Astronergy monocrystalline
photovoltaic modules

Functional unit:
1Wp

Product category /PCR:
[NPCR 029 Version 1.2]

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-6420-5635-EN

Registration number:
NEPD-6420-5635-EN

Issue date:
16.04.2024

Valid to:
16.04.2029



General information

Product:

CHSM72N(DG)/F-HC, CHSM72N(DG)/F-BH
CHSM54N-HC, CHSM54N(BL)-HC
CHSM54N(BLH)-HC, CHSM54N(DG)/F-HC
CHSM54N(DGT)/F-BH, CHSM54N(DGT)(BLH)/F-BH

Program operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Tlf: +47 23 08 80 00
e-mail: post@epd-norge.no

Declaration number:

NEPD-6420-5635-EN

This declaration is based on Product Category Rules:

NPCR 029 version 1.2

This EPD follows additional requirements for construction products considered as Electronic or Electric Equipment.

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Functional unit:

1 Wp

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal external

Lucas Pedro Berman 

Independent verifier approved by EPD Norway

Owner of the declaration:

Chint New Energy Technology Co., Ltd.
Contact person: Gan Chen
Phone: +86 571 5603 2361
e-mail: gan.chen1@Astronergy.com

Manufacturer:

Chint New Energy Technology Co., Ltd.
Address: No.1 Jisheng Road, Jianshan New District, Haining, P.R. China

Chint Solar (Haining) Co., Ltd
Address: No.2 Jisheng Road, Jianshan New District, Haining, P.R. China

Place of production:

Haining, P.R. China

Management system:

ISO 9001, ISO 14001, ISO 45001

Organisation no:

913304813502083466

Issue date:

16.04.2024

Valid to:

16.04.2029

Year of study:

2022.11-2023.10

Comparability:

EPD of construction products may not be able to compare if they do not comply with EN 15804 and are seen in a building context.

The EPD has been worked out by:

Star Talers Environmental Technology



Approved



Manager of EPD Norway

Product

Product description:

Astronergy places a strong emphasis on technological innovation and substantial investments in research and development. Astronergy has consistently introduced the ASTRO series of high-efficiency modules, including the ASTRO monocrystalline bifacial series and the ASTRO monocrystalline mono-facial series. These modules leverage cutting-edge photovoltaic technologies such as large-format silicon wafers, half-cutting, MBB (Multi Busbar), non-destructive cutting, and high-density design to maximize module power and efficiency. These innovations have earned the company certifications in numerous mainstream markets worldwide, including China, Europe, Australia, Japan, South Korea, Israel, Brazil, and the United States, with performance metrics that meet international first-class standards.

Astronergy's commitment to excellence and technological leadership is evident in its recognition as a seven-time "Top Performer" by PVEL/DNV GL, a top module manufacturer, and its consistent inclusion in Bloomberg's prestigious list of world-class Tier 1 suppliers of photovoltaic modules. These accolades underscore the company's reliability and position as a market leader in the solar energy industry.

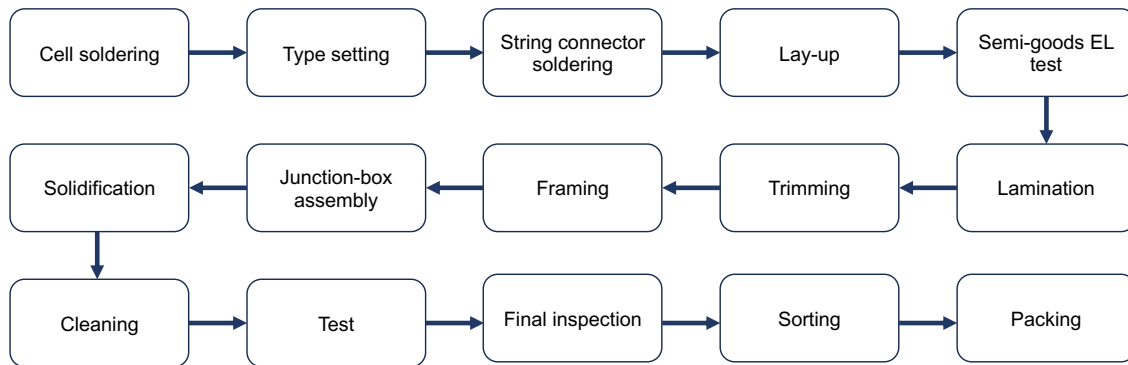
Astronergy remains unwavering in its dedication to an innovation-driven, high-quality development approach, consistently delivering superior-quality, highly reliable, and long-term stable module products to its customers. The company spares no effort in advancing the photovoltaic industry and empowering the world with sustainable and efficient green energy solutions.

Product specification:

Materials compositions and technical data for the declared product are shown below.

Materials	CHSM72N(DG)/F-HC CHSM72N(DG)/F-BH		CHSM54N-HC CHSM54N(BL)-HC CHSM54N(BLH)-HC		CHSM54N(DG)/F-HC CHSM54N(DGT)/F-BH CHSM54N(DGT)(BLH)/F-BH	
	kg/FU	%	kg/FU	%	kg/FU	%
Frame	3.90E-03	7.1%	4.36E-03	8.9%	4.47E-03	9.1%
Backsheet	0.00E+00	0.0%	1.93E-03	3.9%	0.00E+00	0.0%
Glass	4.21E-02	77.1%	3.39E-02	69.1%	3.55E-02	72.7%
Cell	1.14E-03	2.1%	1.16E-03	2.4%	1.21E-03	2.5%
Solder	2.69E-04	0.5%	2.73E-04	0.6%	3.49E-04	0.7%
Busbar	6.72E-05	0.1%	9.09E-05	0.2%	1.16E-04	0.2%
EVA	1.94E-03	3.6%	1.90E-03	3.9%	2.05E-03	4.2%
POE	3.18E-04	0.6%	1.71E-03	3.5%	0.00E+00	0.0%
EPE	1.61E-03	2.9%	0.00E+00	0.0%	2.04E-03	4.2%
Junction box	2.12E-04	0.4%	5.30E-04	1.1%	5.42E-04	1.1%
Flux	1.68E-05	<0.01%	2.27E-05	<0.01%	2.33E-05	<0.01%
Silicone	6.72E-04	1.2%	8.41E-04	1.7%	9.30E-05	0.2%
Packaging film (PE)	3.36E-05	0.1%	2.27E-05	<0.01%	4.65E-05	0.1%
Packaging bag (PVC)	8.40E-05	0.2%	9.09E-05	0.2%	1.40E-04	0.3%
Pallet	1.70E-03	3.1%	1.61E-03	3.3%	1.65E-03	3.4%
Corrugated board box	5.04E-05	0.1%	6.82E-05	0.1%	6.98E-05	0.1%
Paper Bead	2.02E-05	<0.01%	3.18E-05	0.1%	3.95E-05	0.1%
Paper Cover	6.72E-05	0.1%	6.82E-05	0.1%	6.98E-05	0.1%
Packaging frame (Paper)	3.70E-04	0.7%	4.09E-04	0.8%	4.19E-04	0.9%

Description of production processes:



Step 1: Cell soldering

Cells prepared on the feed port are heated by infrared tubes. Transmit the heat to ribbons to fusing the stannum on the cells.

Step 2: Typesetting/ soldering/ lay up

Lay up glass, EVA, cell strings automatically, use tape to fix the cell strings, solder cross connectors to form a circuitry, meanwhile lay up EVA, back sheet, paste the SN label. At last record information into AMES system.

Step 3: Semi-goods EL Test

Scan SN label and take photos automatically. Operators inspect the EL pictures according the EL standard. AI intelligent judgment.

Step 4: Lamination

The semi-goods flow to laminator automatically. Put 4 pieces of semi-goods once regardless of 72pcs or 54pcs cells.

Step 5: Trimming

Trimming the edge of semi-goods automatically to ensure the edge is smooth.

Step 6: Framing

Put Aluminum rails on the feed port, inject silicone gel into the groove. Then mechanical arm grabs glued frames and compresses to the module automatically.

Step 7: J-Box Assemble

Fix junction box to glue machine, glue silicone to cover the bottom of J-box. Its appearance should be smooth.

Step 8: J-Box glue

Fill the AB gel to the J-Box. After solidifying it can protect the metal component from the humidity to ensure electrical function.

Step 9: Solidification

The modules are placed on the conveyor by mechanical arm, and then transferred into the solidification room.

Step 10: Module Cleaning

Operators use 99% industrial alcohol to clean the module. And assemble the J-Box lid.

Step 11: Power Test

Simulate outside light, guarantee the consistency of result under a series of standard condition. Use xenon light as source, and the light shapes as pulse to decrease the power loss as much as possible. Specific data is pasted on the label of back sheet.

Step 12: Final EL Test

Utilize electroluminescence technology to detect a number of defects, such as micro cracks, grain boundaries, broken contacts and shunts.

Step 13: Final Inspection

Modules enter final inspection where inspectors check for visual defects, EL pictures and related module size and so on. AI intelligent assisted judgment.

Step 14: Sorting

According to different power, currents, colors and ranks, modules are distinguished automatically.

Step 15: Packing

Modules which have passed the final inspection are transported to packing area, each module of pallets turns over of 90° and 180° in order, and then cover the box, strap and wrap automatically. Present packing type is vertical.

Step 16: Entering warehouse

Transport the packaged modules to the warehouse and get prepared for delivery to customers.

Technical data:

Series (model name)	Power output range (Wp)	Dimensions (mm ³)	Area (m ²)	Module efficiency (%)	Weight (kg)	1st year degradation (%)	Annual degradation (%)
CHSM72N(DG)/F-HC	570-595	2278*1134*30	2.58	22.1~23.0	32.1	1	0.4
CHSM72N(DG)/F-BH	570-595	2278*1134*30	2.58	22.1~23.0	32.1	1	0.4
CHSM54N-HC	425-445	1722*1134*30	1.95	21.8~22.8	21.3	1	0.4
CHSM54N(BL)-HC	420-440	1722*1134*30	1.95	21.5~22.5	21.3	1	0.4
CHSM54N(BLH)-HC	420-440	1722*1134*30	1.95	21.5~22.5	21.3	1	0.4
CHSM54N(DG)/F-HC	425-440	1722*1134*30	1.95	21.8~22.5	20.8	1	0.4
CHSM54N(DGT)/F-BH	415-430	1722*1134*30	1.95	21.3~22.0	20.8	1	0.4
CHSM54N(DGT)(BLH)/F-BH	415-430	1722*1134*30	1.95	21.3~22.0	20.8	1	0.4

Geographical area:

The products are produced and manufactured in China, and the evaluation incorporated the current market scenario in China. End-of-life scenario are based on EU regulation. The products are intended for global distribution and application.

Reference service life, product:

25 years

Type of EPD

This declaration is a specific EPD using a representative power output for each product. LCA Results of various power output ranges could be obtained using the conversion factors presented in the Chapter "additional requirements".

LCA: Calculation rules

Functional unit:

Functional unit is 1 Wp of manufactured photovoltaic module, with activities needed for a study period for a defined reference service life ($\geq 80\%$ of the labelled power output).

Cut-off criteria:

For the processes within the system boundary, all available energy and material flow data have been included in the model. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts. The following steps/stages are not included in the system boundary due to the reason that the elements below are considered irrelevant or not within the boundary:

- Impacts related to the production, transportation and installation of capital goods (buildings, infrastructure, machinery, internal transport packaging) and general operations (staff travel, marketing and communication actions) that cannot be directly allocated to products are excluded from the LCA study;
- The packaging for silicon wafer and solar cells is reused internally and its impact was excluded from the system;
- Emissions during the PV module installation and operation due to no obvious emission observable;
- Storage phases and sales of PV products due to no observable impact. Product losses due to abnormal damage such as natural disasters or fire accidents would occur at a rather low frequency;
- Handling operations at the distribution center and retail outlet due to small contribution and negligible impact;
- Research and development activities;
- Long-term emissions.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through power output allocation. For the end-of-life allocation of background data (energy and materials), the model “allocation cut-off by classification (ISO standard) is used. As for the end-of-life stage of the solar PV modules, the load and benefit of reuse, recycling, and recovery processes is reported separately following the PCR’s recommendation.

Data quality:

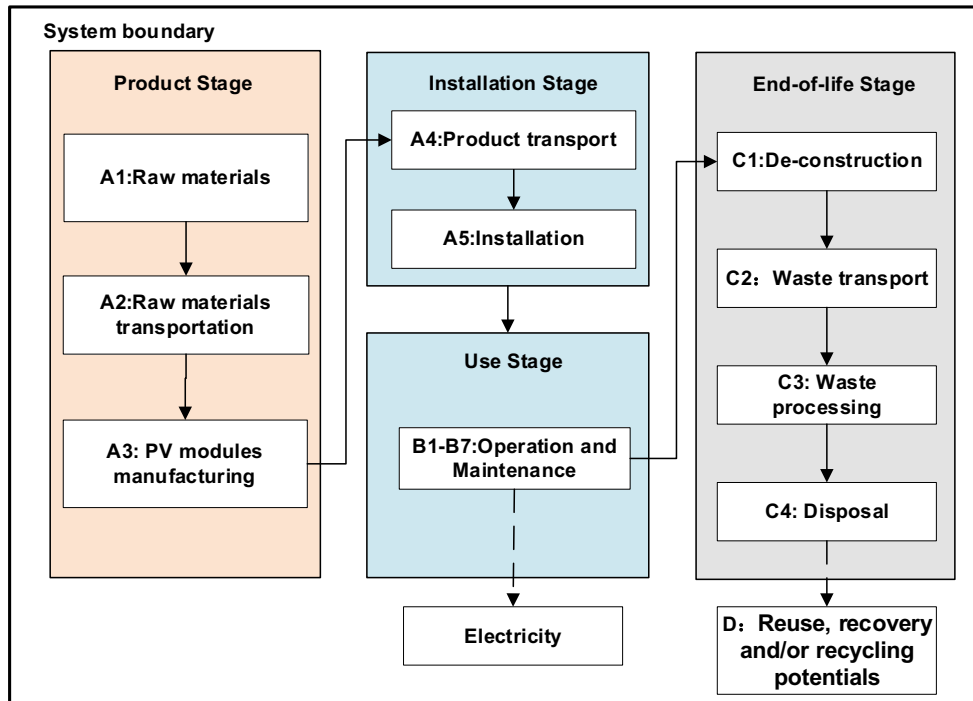
Primary data (such as materials or energy flows that enter and leave the production system) is from Astronergy manufacturing facilities for the period spanning from Nov. 2022 to Oct. 2023 (annual average). Generic data related to the life cycle impacts of the material or energy flows that enter and leave the production system is sourced from Ecoinvent 3.9 "allocation, cut-off by classification - unit" database.

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

System boundary:

The system boundary for this LCA study of PV modules encompasses product stage, installation stage, use stage, and end-of-life stage, from cradle to grave and module D.



LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Transport from production place to assembly/user (A4)

Transport from production place to assembly/user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck	36.7	1151.26	Diesel	kg/tkm	0.0366

For all products, domestic market of China applies, transportation distances are calculated as an aggregate of distances to each respective region, weighted by their market ratio.

Assembly (A5)

	Unit	Value
Water consumption	m ³ /FU	-
Electricity consumption	kWh/FU	6.32E-5
Other energy carriers	MJ/FU	Diesel: 1.35E-2
Material loss	kg/FU	-
Output materials from waste treatment	kg/FU	1.21E-3~1.27E-3

According to PCR, mounting structures and electrical components will not be included in this stage, only energy consumption, waste generation and treatment of packaging materials will be considered. The waste from the products' packaging is considered in this stage, and waste treatment of wood pallet is modeled as 75% recycling and 25% incineration. Other packaging materials including paper and plastic film are modeled with 100% incineration.

Use (B1)

There are no material or energy inputs, nor emissions during the use phase (B1) of the PV module.

Maintenance (B2)/Repair (B3)

	Unit	Value
Water consumption	m ³ /FU	1.93E-5~2.67E-5

As for the maintenance stage (B2), water used for cleaning to maintain the performance is considered, 0.23L water used per module each time, and 2 times in a year are assumed. During the operation of PV module, no repair (B3) is required.

Replacement (B4)/Refurbishment (B5)

It is assumed that the PV module itself does not require replacement and refurbishment during its RSL.

Operational energy (B6) and water consumption (B7)

It is assumed that there is no operational electricity (B6) or water consumption (B7). To calculate the expected energy production over the lifetime of the panels, the following formula may be used:

$$E_1 = S_{rad} * A * y * PR * (1 - deg)$$

Where:

E_1 = 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, m².

y = Module yield: electrical power, kWp for standard test conditions (STC) of the module divided by the area of the module.

STC: The ratio is given for standard test conditions: irradiance 1000 W/m², cell temperature 25 °C, wind speed 1 m/s, AM1.5.

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

Energy production second year of operation:

$$E_2 = E_1 * (1 - deg)$$

Energy production n year of operation:

$$E_n = E_1 * (1 - deg)^{n-1}$$

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

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

Operational energy (B6) and water consumption (B7)

No inputs and outputs during operation stage.

End of Life (C1, C3, C4)

	Unit	CHSM72N(DG)/F-HC CHSM72N(DG)/F-BH	CHSM54N-HC CHSM54N(BL)-HC CHSM54N(BLH)-HC	CHSM54N(DG)/F-HC CHSM54N(DGT)/F-BH CHSM54N(DGT)(BLH)/F-BH
Hazardous waste disposed	kg/FU	-	-	-
Collected as mixed construction waste	kg/FU	5.39E-02	4.84E-02	4.84E-02
Reuse	kg/FU	-	-	-
Recycling	kg/FU	4.22E-02	3.56E-02	3.67E-02
Energy recovery	kg/FU	4.29E-03	6.60E-03	5.18E-03
To landfill	kg/FU	7.45E-03	6.24E-03	6.54E-03

Assumptions are made for C1, C3 and C4 stage. Decommissioning stage (C1) of PV modules is assumed to be taken with same energy and fuel consumption as for installation stage. Waste processing (C3) stage is assumed to be mechanically treated to yield the bulk materials. Modelling



of disposal stage (C4) refers to legal requirements issued by Waste Electrical and Electronic Equipment (WEEE) under the EU scenario.

Transport to waste processing (C2)

Transport from production place to assembly/user (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy consumption	Unit	Value
Truck	36.7	50	Diesel	kg/tkm	0.036

50km transportation distance from the plant site to waste treatment site (C2) is assumed according to PCR.

Benefits and loads beyond the system boundaries (D)

Benefits and loads beyond the system boundaries (D)	Unit	CHSM72N(DG)/F-HC CHSM72N(DG)/F-BH	CHSM54N-HC CHSM54N(BL)-HC CHSM54N(BLH)-HC	CHSM54N(DG)/F-HC CHSM54N(DGT)/F-BH CHSM54N(DGT)(BLH)/ F-BH
Substitution of electricity	MJ/FU	2.79E-02	3.48E-02	3.12E-02
Substitution of thermal energy, district heating	MJ/FU	5.28E-02	6.53E-02	5.92E-02
Substitution of converter aluminum with net scrap	kg/FU	1.01E-03	1.13E-03	1.16E-03
Substitution of primary silver with net scrap	kg/FU	8.40E-06	9.09E-06	9.30E-06
Substitution of primary copper with net scrap	kg/FU	7.06E-05	9.32E-05	1.19E-04
Substitution of primary glass with glass gullets	kg/FU	3.04E-02	2.45E-02	2.57E-02
Substitution of primary wood pallet with recycled wood	kg/FU	1.27E-03	1.21E-03	1.24E-03



LCA: Results

The LCA results show the environmental impacts and resource input and output flows calculated according to EN 15804:2012+A2. The results are shown per functional unit (1Wp). The LCA results have been calculated using the LCA software SimaPro 9.5.

Core environmental impact indicators

CHSM72N(DG)/F-HC and CHSM72N(DG)/F-BH (595Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP - total	kg CO ₂ eq	3.83E-01	1.22E-02	4.98E-03	0.00E+00	2.39E-05	0.00E+00	1.40E-03	5.09E-04	1.42E-02	9.78E-03	-1.82E-01
GWP - fossil	kg CO ₂ eq	3.84E-01	1.22E-02	1.80E-03	0.00E+00	2.39E-05	0.00E+00	1.40E-03	5.08E-04	1.42E-02	9.78E-03	-1.81E-01
GWP - biogenic	kg CO ₂ eq	-1.48E-03	3.23E-06	3.19E-03	0.00E+00	3.78E-08	0.00E+00	1.77E-07	1.34E-07	2.05E-06	9.63E-07	-7.07E-04
GWP - luluc	kg CO ₂ eq	4.09E-04	6.43E-06	3.29E-07	0.00E+00	3.16E-08	0.00E+00	1.74E-07	2.68E-07	5.62E-06	1.24E-07	-2.03E-04
ODP	kg CFC11 eq	7.23E-09	1.92E-10	5.48E-11	0.00E+00	3.70E-13	0.00E+00	2.14E-11	8.01E-12	2.51E-11	1.20E-11	-1.15E-08
AP	molc H+ eq	2.31E-03	3.02E-05	1.35E-05	0.00E+00	1.27E-07	0.00E+00	1.27E-05	1.26E-06	7.53E-05	2.80E-06	-1.34E-03
EP - freshwater	kg P eq	1.25E-05	1.16E-07	1.03E-08	0.00E+00	9.57E-10	0.00E+00	6.10E-09	4.84E-09	3.01E-07	3.62E-09	-1.99E-05
EP - marine	kg N eq	4.94E-04	7.19E-06	6.05E-06	0.00E+00	2.37E-08	0.00E+00	5.80E-06	2.99E-07	1.55E-05	1.27E-06	-3.62E-04
EP - terrestrial	molc N eq	4.98E-03	7.57E-05	6.58E-05	0.00E+00	2.63E-07	0.00E+00	6.31E-05	3.15E-06	1.71E-04	1.32E-05	-4.19E-03
POCP	kg NMVOC eq	1.46E-03	4.03E-05	1.96E-05	0.00E+00	8.47E-08	0.00E+00	1.87E-05	1.68E-06	4.51E-05	3.52E-06	-9.84E-04
ADP-M&M ²	kg Sb-Eq	4.51E+00	1.72E-01	2.02E-02	0.00E+00	2.87E-04	0.00E+00	1.81E-02	7.16E-03	1.38E-01	3.58E-03	-2.45E+00
ADP-fossil ²	MJ	1.59E-05	3.97E-08	1.32E-09	0.00E+00	1.09E-10	0.00E+00	5.05E-10	1.65E-09	9.08E-09	6.25E-10	-3.99E-04
WDP ²	m ³	4.41E-01	7.66E-04	1.04E-04	0.00E+00	7.89E-04	0.00E+00	4.43E-05	3.19E-05	1.57E-03	5.19E-04	1.45E-01

CHSM54N-HC, CHSM54N(BL)-HC, and CHSM54N(BLH)-HC (440Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP - total	kg CO ₂ eq	3.94E-01	1.10E-02	4.96E-03	0.00E+00	3.24E-05	0.00E+00	1.40E-03	4.56E-04	1.28E-02	1.45E-02	-9.66E-02
GWP - fossil	kg CO ₂ eq	3.95E-01	1.10E-02	1.79E-03	0.00E+00	3.23E-05	0.00E+00	1.40E-03	4.56E-04	1.28E-02	1.45E-02	-9.61E-02
GWP - biogenic	kg CO ₂ eq	-1.55E-03	2.91E-06	3.17E-03	0.00E+00	5.11E-08	0.00E+00	1.77E-07	1.21E-07	1.84E-06	1.19E-06	-3.92E-04
GWP - luluc	kg CO ₂ eq	4.31E-04	5.79E-06	3.43E-07	0.00E+00	4.28E-08	0.00E+00	1.74E-07	2.40E-07	5.04E-06	1.52E-07	-1.45E-04



ODP	kg CFC11 eq	3.66E-08	1.73E-10	5.82E-11	0.00E+00	5.01E-13	0.00E+00	2.14E-11	7.18E-12	2.25E-11	1.65E-11	-2.14E-09
AP	molc H+ eq	2.33E-03	2.72E-05	1.36E-05	0.00E+00	1.71E-07	0.00E+00	1.27E-05	1.13E-06	6.76E-05	3.79E-06	-6.35E-04
EP- freshwater	kg P eq	1.31E-05	1.05E-07	1.06E-08	0.00E+00	1.29E-09	0.00E+00	6.10E-09	4.34E-09	2.70E-07	4.82E-09	-5.23E-06
EP -marine	kg N eq	5.00E-04	6.48E-06	6.08E-06	0.00E+00	3.21E-08	0.00E+00	5.80E-06	2.68E-07	1.39E-05	1.75E-06	-1.23E-04
EP - terrestrial	molc N eq	5.01E-03	6.82E-05	6.62E-05	0.00E+00	3.56E-07	0.00E+00	6.31E-05	2.83E-06	1.53E-04	1.81E-05	-1.42E-03
POCP	kg NMVOC eq	1.48E-03	3.63E-05	1.97E-05	0.00E+00	1.15E-07	0.00E+00	1.87E-05	1.51E-06	4.05E-05	4.72E-06	-3.89E-04
ADP-M&M ²	kg Sb-Eq	4.78E+00	1.55E-01	2.03E-02	0.00E+00	3.88E-04	0.00E+00	1.81E-02	6.43E-03	1.24E-01	4.17E-03	-1.17E+00
ADP-fossil ²	MJ	1.63E-05	3.58E-08	1.39E-09	0.00E+00	1.47E-10	0.00E+00	5.05E-10	1.48E-09	8.15E-09	8.28E-10	-4.66E-05
WDP ²	m ³	4.52E-01	6.90E-04	1.10E-04	0.00E+00	1.07E-03	0.00E+00	4.43E-05	2.86E-05	1.41E-03	7.22E-04	-1.05E-02

CHSM54N(DG)/F-HC, CHSM54N(DGT)/F-BH, and CHSM54N(DGT)(BLH)/F-BH (430Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP - total	kg CO ₂ eq	4.03E-01	1.10E-02	5.23E-03	0.00E+00	3.31E-05	0.00E+00	1.40E-03	4.56E-04	1.28E-02	1.11E-02	-9.82E-02
GWP - fossil	kg CO ₂ eq	4.04E-01	1.10E-02	1.98E-03	0.00E+00	3.30E-05	0.00E+00	1.40E-03	4.56E-04	1.28E-02	1.11E-02	-9.77E-02
GWP - biogenic	kg CO ₂ eq	-1.41E-03	2.92E-06	3.25E-03	0.00E+00	5.23E-08	0.00E+00	1.77E-07	1.21E-07	1.84E-06	9.98E-07	-4.10E-04
GWP - luluc	kg CO ₂ eq	4.44E-04	5.80E-06	4.02E-07	0.00E+00	4.38E-08	0.00E+00	1.74E-07	2.40E-07	5.04E-06	1.28E-07	-1.51E-04
ODP	kg CFC11 eq	8.58E-09	1.74E-10	7.51E-11	0.00E+00	5.12E-13	0.00E+00	2.14E-11	7.18E-12	2.25E-11	1.31E-11	-2.20E-09
AP	molc H+ eq	2.42E-03	2.73E-05	1.38E-05	0.00E+00	1.75E-07	0.00E+00	1.27E-05	1.13E-06	6.75E-05	3.03E-06	-6.49E-04
EP- freshwater	kg P eq	1.35E-05	1.05E-07	1.24E-08	0.00E+00	1.32E-09	0.00E+00	6.10E-09	4.34E-09	2.70E-07	3.89E-09	-5.36E-06
EP -marine	kg N eq	5.18E-04	6.49E-06	6.13E-06	0.00E+00	3.28E-08	0.00E+00	5.80E-06	2.68E-07	1.39E-05	1.39E-06	-1.25E-04
EP - terrestrial	molc N eq	5.19E-03	6.84E-05	6.68E-05	0.00E+00	3.64E-07	0.00E+00	6.31E-05	2.83E-06	1.53E-04	1.44E-05	-1.45E-03
POCP	kg NMVOC eq	1.52E-03	3.64E-05	1.98E-05	0.00E+00	1.17E-07	0.00E+00	1.87E-05	1.51E-06	4.04E-05	3.79E-06	-3.99E-04
ADP-M&M ²	kg Sb-Eq	4.76E+00	1.55E-01	2.08E-02	0.00E+00	3.97E-04	0.00E+00	1.81E-02	6.42E-03	1.24E-01	3.61E-03	-1.20E+00
ADP-fossil ²	MJ	1.86E-05	3.59E-08	1.67E-09	0.00E+00	1.51E-10	0.00E+00	5.05E-10	1.48E-09	8.14E-09	6.70E-10	-4.78E-05
WDP ²	m ³	4.71E-01	6.92E-04	1.38E-04	0.00E+00	1.09E-03	0.00E+00	4.43E-05	2.86E-05	1.41E-03	5.69E-04	-7.89E-03

GWP-total: Global Warming Potential; **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; See “additional Norwegian requirements” for indicator given as PO₄ eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

Reading example: 9.0 E-03 = 9.0*10⁻³ = 0.009



Additional environmental impact indicators

CHSM72N(DG)/F-HC and CHSM72N(DG)/F-BH (595Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	Disease incidence	2.81E-08	9.07E-10	3.61E-10	0.00E+00	1.56E-12	0.00E+00	3.50E-10	3.78E-11	1.05E-09	2.41E-11	-1.26E-08
IRP ¹	kBq U235 eq.	8.62E-03	6.13E-05	7.66E-06	0.00E+00	8.35E-07	0.00E+00	4.39E-06	2.55E-06	1.91E-04	1.97E-06	-3.26E-03
ETP-fw ²	CTUe	2.34E+00	9.45E-02	2.25E-02	0.00E+00	1.05E-04	0.00E+00	8.52E-03	3.93E-03	3.85E-02	2.00E-02	-5.20E+00
HTP-c ²	CTUh	2.28E-10	5.54E-12	7.16E-13	0.00E+00	5.65E-14	0.00E+00	4.21E-13	2.31E-13	2.91E-12	8.90E-13	-7.49E-10
HTP-nc ²	CTUh	4.82E-09	1.24E-10	7.10E-12	0.00E+00	7.99E-13	0.00E+00	3.41E-12	5.18E-12	1.33E-10	3.03E-11	-2.23E-07
SQP ²	Dimensionless	1.53E+00	1.04E-01	2.27E-03	0.00E+00	5.96E-05	0.00E+00	1.29E-03	4.33E-03	2.68E-02	4.83E-03	-2.52E+00

CHSM54N-HC, CHSM54N(BL)-HC, and CHSM54N(BLH)-HC (440Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	Disease incidence	2.85E-08	8.17E-10	3.62E-10	0.00E+00	2.12E-12	0.00E+00	3.50E-10	3.39E-11	9.44E-10	2.73E-11	-5.45E-09
IRP ¹	kBq U235 eq.	8.96E-03	5.53E-05	7.98E-06	0.00E+00	1.13E-06	0.00E+00	4.39E-06	2.29E-06	1.72E-04	2.55E-06	-1.99E-03
ETP-fw ²	CTUe	2.34E+00	8.51E-02	2.39E-02	0.00E+00	1.42E-04	0.00E+00	8.52E-03	3.53E-03	3.46E-02	2.92E-02	-8.02E-01
HTP-c ²	CTUh	2.41E-10	4.99E-12	7.82E-13	0.00E+00	7.64E-14	0.00E+00	4.21E-13	2.07E-13	2.61E-12	1.30E-12	-1.30E-10
HTP-nc ²	CTUh	5.16E-09	1.12E-10	7.45E-12	0.00E+00	1.08E-12	0.00E+00	3.41E-12	4.64E-12	1.19E-10	4.48E-11	-2.68E-08
SQP ²	Dimensionless	1.56E+00	9.38E-02	2.33E-03	0.00E+00	8.06E-05	0.00E+00	1.29E-03	3.89E-03	2.41E-02	4.39E-03	-1.13E+00

CHSM54N(DG)/F-HC, CHSM54N(DGT)/F-BH, and CHSM54N(DGT)(BLH)/F-BH (430Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	Disease incidence	2.95E-08	8.19E-10	3.64E-10	0.00E+00	2.16E-12	0.00E+00	3.50E-10	3.38E-11	9.44E-10	2.40E-11	-5.56E-09
IRP ¹	kBq U235 eq.	9.20E-03	5.54E-05	9.46E-06	0.00E+00	1.16E-06	0.00E+00	4.39E-06	2.29E-06	1.72E-04	2.10E-06	-2.09E-03
ETP-fw ²	CTUe	2.48E+00	8.53E-02	3.10E-02	0.00E+00	1.45E-04	0.00E+00	8.52E-03	3.53E-03	3.46E-02	2.25E-02	-8.34E-01
HTP-c ²	CTUh	2.54E-10	5.00E-12	8.29E-13	0.00E+00	7.82E-14	0.00E+00	4.21E-13	2.07E-13	2.61E-12	1.00E-12	-1.35E-10
HTP-nc ²	CTUh	5.56E-09	1.12E-10	8.30E-12	0.00E+00	1.10E-12	0.00E+00	3.41E-12	4.64E-12	1.19E-10	3.43E-11	-2.75E-08
SQP ²	Dimensionless	1.63E+00	9.40E-02	2.48E-03	0.00E+00	8.25E-05	0.00E+00	1.29E-03	3.88E-03	2.41E-02	4.38E-03	-1.17E+00



PM: Particulate matter emissions; IRP: Ionising radiation, human health; ETP-fw: Ecotoxicity (freshwater); ETP-c: Human toxicity, cancer effects; HTP-nc: Human toxicity, non-cancer effects; SQP: Land use related impacts / soil quality

¹ This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

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

Resource use

CHSM72N(DG)/F-HC and CHSM72N(DG)/F-BH (595Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
RPEE	MJ	8.95E-01	2.22E-03	2.74E-04	0.00E+00	2.74E-05	0.00E+00	1.62E-04	9.26E-05	1.47E-02	2.96E-02	-4.67E-01
RPEM	MJ	2.95E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.95E-02	0.00E+00
TPE	MJ	9.25E-01	2.22E-03	2.74E-04	0.00E+00	2.74E-05	0.00E+00	1.62E-04	9.26E-05	1.47E-02	9.57E-05	-4.67E-01
NRPE	MJ	5.20E+00	1.71E-01	1.84E-01	0.00E+00	3.31E-04	0.00E+00	1.78E-02	7.11E-03	2.05E-01	3.68E-03	-2.67E+00
NRPM	MJ	1.64E-01	0.00E+00	-1.64E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRPE	MJ	5.37E+00	1.71E-01	1.99E-02	0.00E+00	3.31E-04	0.00E+00	1.78E-02	7.11E-03	2.05E-01	3.68E-03	-2.67E+00
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	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	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	0.00E+00	0.00E+00
W	m ³	1.16E-02	2.47E-05	3.46E-06	0.00E+00	1.84E-05	0.00E+00	1.53E-06	1.03E-06	3.76E-05	1.58E-05	-2.25E-03

CHSM54N-HC, CHSM54N(BL)-HC, and CHSM54N(BLH)-HC (440Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
RPEE	MJ	9.22E-01	2.00E-03	2.85E-04	0.00E+00	3.71E-05	0.00E+00	1.62E-04	8.31E-05	1.32E-02	2.95E-02	-2.58E-01
RPEM	MJ	2.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.93E-02	0.00E+00
TPE	MJ	9.52E-01	2.00E-03	2.85E-04	0.00E+00	3.71E-05	0.00E+00	1.62E-04	8.31E-05	1.32E-02	1.28E-04	-2.58E-01
NRPE	MJ	5.46E+00	1.54E-01	2.28E-01	0.00E+00	4.48E-04	0.00E+00	1.78E-02	6.38E-03	1.84E-01	4.34E-03	-1.37E+00
NRPM	MJ	2.07E-01	0.00E+00	-2.07E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



TRPE	MJ	5.66E+00	1.54E-01	2.00E-02	0.00E+00	4.48E-04	0.00E+00	1.78E-02	6.38E-03	1.84E-01	4.34E-03	-1.37E+00
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	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	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	0.00E+00	0.00E+00
W	m ³	1.19E-02	2.23E-05	3.69E-06	0.00E+00	2.49E-05	0.00E+00	1.53E-06	9.24E-07	3.38E-05	2.23E-05	-1.04E-03

CHSM54N(DG)/F-HC, CHSM54N(DGT)/F-BH, and CHSM54N(DGT)(BLH)/F-BH (430Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
RPEE	MJ	9.58E-01	2.01E-03	3.35E-04	0.00E+00	3.79E-05	0.00E+00	1.62E-04	8.30E-05	1.32E-02	3.02E-02	-2.68E-01
RPEM	MJ	3.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.01E-02	0.00E+00
TPE	MJ	9.88E-01	2.01E-03	3.35E-04	0.00E+00	3.79E-05	0.00E+00	1.62E-04	8.30E-05	1.32E-02	1.03E-04	-2.68E-01
NRPE	MJ	5.49E+00	1.54E-01	2.05E-01	0.00E+00	4.58E-04	0.00E+00	1.78E-02	6.37E-03	1.84E-01	3.73E-03	-1.39E+00
NRPM	MJ	1.85E-01	0.00E+00	-1.85E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRPE	MJ	5.67E+00	1.54E-01	2.05E-02	0.00E+00	4.58E-04	0.00E+00	1.78E-02	6.37E-03	1.84E-01	3.73E-03	-1.39E+00
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	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	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	0.00E+00	0.00E+00
W	m ³	1.24E-02	2.23E-05	4.46E-06	0.00E+00	2.55E-05	0.00E+00	1.53E-06	9.23E-07	3.37E-05	1.75E-05	-9.94E-04

RPEE Renewable primary energy resources used as energy carrier; *RPEM* Renewable primary energy resources used as raw materials; *TPE* Total use of renewable primary energy resources; *NRPE* Nonrenewable primary energy resources used as energy carrier; *NRPM* Nonrenewable primary energy resources used as materials; *TRPE* Total use of non-renewable primary energy resources; *SM* Use of secondary materials; *RSF* Use of renewable secondary fuels; *NRSF* Use of non-renewable secondary fuels; *W* Use of net fresh water.

End of life – Waste

CHSM72N(DG)/F-HC and CHSM72N(DG)/F-BH (595Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HW	kg	6.78E-04	1.11E-06	1.30E-07	0.00E+00	8.16E-10	0.00E+00	1.18E-07	4.63E-08	7.14E-08	2.00E-08	2.27E-05
NHW	kg	3.60E-02	8.49E-03	1.11E-04	0.00E+00	3.32E-06	0.00E+00	2.95E-05	3.53E-04	4.23E-02	1.16E-02	-2.13E-02
RW	kg	5.73E-06	3.52E-08	4.78E-09	0.00E+00	5.06E-10	0.00E+00	2.54E-09	1.47E-09	1.46E-07	1.27E-09	-2.14E-06

CHSM54N-HC, CHSM54N(BL)-HC, and CHSM54N(BLH)-HC (440Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HW	kg	6.89E-04	1.00E-06	1.30E-07	0.00E+00	1.10E-09	0.00E+00	1.18E-07	4.15E-08	6.41E-08	2.38E-08	3.02E-05
NHW	kg	3.63E-02	7.65E-03	1.16E-04	0.00E+00	4.49E-06	0.00E+00	2.95E-05	3.17E-04	3.60E-02	1.24E-02	-1.14E-02
RW	kg	5.95E-06	3.17E-08	5.00E-09	0.00E+00	6.85E-10	0.00E+00	2.54E-09	1.32E-09	1.31E-07	1.66E-09	-1.29E-06

CHSM54N(DG)/F-HC, CHSM54N(DGT)/F-BH, and CHSM54N(DGT)(BLH)/F-BH (430Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HW	kg	7.19E-04	1.00E-06	1.32E-07	0.00E+00	1.13E-09	0.00E+00	1.18E-07	4.15E-08	6.41E-08	2.04E-08	3.08E-05
NHW	kg	3.81E-02	7.66E-03	1.26E-04	0.00E+00	4.59E-06	0.00E+00	2.95E-05	3.17E-04	3.70E-02	1.14E-02	-1.17E-02
RW	kg	6.12E-06	3.18E-08	6.04E-09	0.00E+00	7.01E-10	0.00E+00	2.54E-09	1.31E-09	1.31E-07	1.35E-09	-1.35E-06

HW Hazardous waste disposed; *NHW* Non-hazardous waste disposed; *RW* Radioactive waste disposed.

End of life – output flow
CHSM72N(DG)/F-HC and CHSM72N(DG)/F-BH (595Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
CR	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	0.00E+00	0.00E+00
MR	kg	0.00E+00	0.00E+00	1.27E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.23E-02	0.00E+00
MER	kg	0.00E+00	0.00E+00	9.32E-04	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	2.79E-02	0.00E+00
ETE	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	5.28E-02	0.00E+00



CHSM54N-HC, CHSM54N(BL)-HC, and CHSM54N(BLH)-HC (440Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
CR	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	0.00E+00	0.00E+00
MR	kg	0.00E+00	0.00E+00	1.21E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.60E-02	0.00E+00
MER	kg	0.00E+00	0.00E+00	9.81E-04	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	2.48E-02	0.00E+00
ETE	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	6.53E-02	0.00E+00

CHSM54N(DG)/F-HC, CHSM54N(DGT)/F-BH, and CHSM54N(DGT)(BLH)/F-BH (430Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
CR	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	0.00E+00	0.00E+00
MR	kg	0.00E+00	0.00E+00	1.24E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.70E-02	0.00E+00
MER	kg	0.00E+00	0.00E+00	1.01E-03	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	3.12E-02	0.00E+00
ETE	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	5.92E-02	0.00E+00

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy.

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	CHSM72N(DG)/F-HC CHSM72N(DG)/F-BH	CHSM54N-HC CHSM54N(BL)-HC CHSM54N(BLH)-HC	CHSM54N(DG)/ F-HC CHSM54N(DGT)/F-BH CHSM54N(DGT)(BLH)/F-BH
Biogenic carbon content in product	kg C/FU	0	0	0
Biogenic carbon content in the accompanying packaging	kg C/FU	8.69E-04	8.64E-04	8.87E-04

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂

Additional requirements

Location based electricity mix from the use of electricity in manufacturing

In the context of China, a market-based approach is not applicable due to the absence of a Guarantee of Origin system. Therefore, a location-based approach is employed to assess the environmental impact of electricity in this EPD. Regional production mix from medium voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Regional electricity grid	Data source	Foreground / core [kWh]	GWP _{total} [kg CO ₂ -eq/kWh]	SUM [kg CO ₂ -eq]
<i>Electricity, medium voltage {CN-ECGC} market for electricity, medium voltage Cut-off, U</i>	ecoinvent 3.9	1.14E-2	0.857	9.77E-3

Additional environmental impact indicators required for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
CHSM72N(DG)/F-HC (595Wp) CHSM72N(DG)/F-BH (595Wp)	kg CO ₂ eq	3.84E-01	1.22E-02	1.79E-03	0.00E+00	2.39E-05	0.00E+00	1.40E-03	5.09E-04	1.42E-02	9.78E-03	-1.81E-01
CHSM54N-HC (440Wp) CHSM54N(BL)-HC (440Wp) CHSM54N(BLH)-HC (440Wp)	kg CO ₂ eq	3.96E-01	1.10E-02	1.79E-03	0.00E+00	3.23E-05	0.00E+00	1.40E-03	4.56E-04	1.28E-02	1.45E-02	-9.62E-02



CHSM54N(DG)/F-HC (430Wp)	kg CO ₂ eq	4.04E-01	1.10E-02	1.98E-03	0.00E+00	3.30E-05	0.00E+00	1.40E-03	4.56E-04	1.28E-02	1.11E-02	-9.78E-02
CHSM54N(DGT)/F-BH (430Wp)												
CHSM54N(DGT)(BLH)/F-BH (430Wp)												

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation.

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers.

Documentation available upon request to EPD owner.

- The product contains no substances given by the REACH Candidate list.
- The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.
- The product contains dangerous substances, more than 0,1% by weight, given by the REACH Candidate List, see table.
- The product contains no substances given by the REACH Candidate list.
- The product is classified as hazardous waste, see table.

Indoor environment

This is not relevant to the product under study.

Carbon footprint (A1-C4)

The carbon footprint (per Wp) for CHSM72N(DG)/F-HC (595Wp) and CHSM72N(DG)/F-BH (595Wp) is 4.24E-01kg CO₂ eq./Wp.

The carbon footprint (per Wp) for CHSM54N-HC (440Wp), CHSM54N(BL)-HC (440Wp), CHSM54N(BLH)-HC (440Wp) is 4.38E-01kg CO₂ eq./Wp.

The carbon footprint (per Wp) for CHSM54N(DG)/F-HC (430Wp), CHSM54N(DGT)/F-BH (430Wp), CHSM54N(DGT)(BLH)/F-BH (430Wp) is 4.43E-01kg CO₂ eq./Wp.

EPD results conversion factors of various power output ranges

CHSM72N(DG)/F-HC and CHSM72N(DG)/F-BH

Rated power output range (Wp)	570	575	580	585	590	595
Conversion factor*	1.044	1.035	1.026	1.017	1.008	1

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 595 Wp by relevant conversion factors.



CHSM54N-HC, CHSM54N(BL)-HC, and CHSM54N(BLH)-HC

Rated power output range (Wp)	420	425	430	435	440	445
Conversion factor*	1.048	1.035	1.023	1.011	1	0.989

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 440 Wp by relevant conversion factors.

CHSM54N(DG)/F-HC, CHSM54N(DGT)/F-BH, and CHSM54N(DGT)(BLH)/F-BH

Rated power output range (Wp)	415	420	425	430	435	440
Conversion factor*	1.036	1.024	1.012	1	0.989	0.977






*Note: Environmental impacts of other power outputs are determined by multiplying the results for 430 Wp by relevant conversion factors.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN15804:2012+A2:2019/ AC:2021	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
Ecoinvent: 2023	Swiss Centre for Life Cycle Assessment, v3.9 (www.ecoinvent.ch).
ISO 21930:2017	Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
NPCR Part A:	Construction products and services. Ver. 2.0. April 2021, EPD-Norge.
PCR NPCR 029 version 1.2	PCR – 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.
IEA PVPS Task 12, 2020	Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems.
WEEE Directive:2012/19	EU Article 4,11&15.
LCA Report, 2024	LCA Report of Astronergy Photovoltaic Modules for Environmental Product Declaration



ASTRONERGY

 Global Program Operator	Program Operator	tlf	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-post: web	post@epd-norge.no www.epd-norge.no
 Global Program Operator	Publisher	tlf	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-post: web	post@epd-norge.no www.epd-norge.no
	Owner of the declaration	tlf	+86 571 56032361
	Chint New Energy Technology Co., Ltd No.1 Jisheng Road, Jianshan New Zone, Haining, Zhejiang Province, P.R. China	e-post: web	gan.chen1@Astronergy.com www.astro-energy.com
 SUSTAINABILITY MATTERS	Author of the life cycle assessment	tlf	+86 13422852570
	Star Talers Environmental Technology Qianwan Road 1, Qianhai Shenzhen-Hong Kong Cooperation Zone, Shenzhen China	e-post: web	dandan.li@startalers.cn www.startalers.org
	ECO Platform	web	www.eco-platform.org
	ECO Portal	web	ECO Portal