epd-norway
Global Program Operator

EPD
INTERNATIONAL EPD SYSTEM

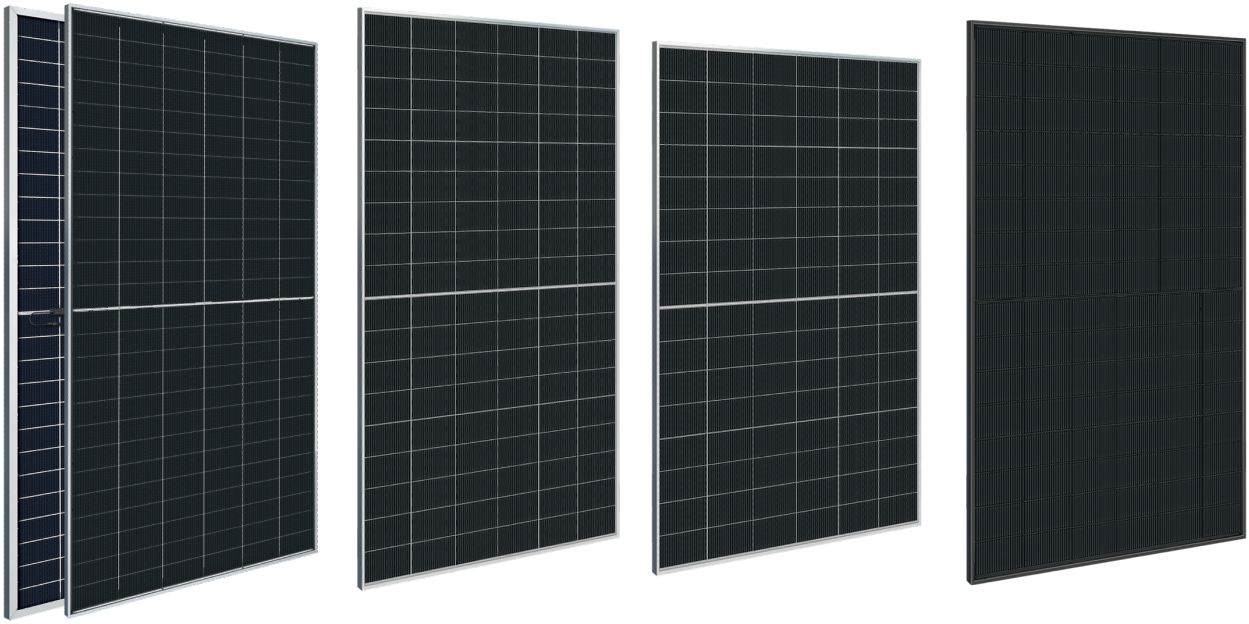
ECO PLATFORM EPD VERIFIED

EPD® International ref. number
EPD-IES-0022406

Environmental Product Declaration

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

ASTRONERGY MONOCRYSTALLINE PHOTOVOLTAIC MODULES



ASTRONERGY

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-9557-9031

Registration number:
NEPD-9557-9031

Issue date:

03.04.2025

Valid to:

03.04.2030

The Norwegian
EPD Foundation

General information

Product:
CHSM78RN(DG)/F-BH

CHSM48RN(DG)/F-BH, CHSM48RN(DG)(BLH)/F-BH,

CHSM48RN(DGT)(BLH)/F-BH

CHSM54RN(DG)/F-BH, CHSM54RN(DGT)(BLH)/F-BH

Program operator:
The Norwegian EPD Foundation
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Declaration number:
NEPD-9557-9031

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 √

Martijn van Hövell

Independent verifier approved by EPD Norway

Owner of the declaration:
Chint New Energy Technology Co., Ltd.
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e-mail: gan.chen1@Astronergy.com

Manufacturer:
- Chint New Energy Technology Co., Ltd.
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- Chint Solar (Haining) Co., Ltd.
Address: NO.2 Jisheng Road, Jianshan New Zone, Huangwan Town, Haining City, Jiaxing City, Zhejiang Province
- Chint New Energy Technology (Fuyang) Co., Ltd.
Address: No.177, TongDeng Road, Lingqiao Town, Fuyang District, Hangzhou, Zhejiang Province
- Songyuan New Energy Technology Co., Ltd.
Address: No.2211 Jianye Avenue, Yadahong Enterprise Service Center, Ningjiang District, Songyuan, China

Place of production:
Zhejiang & Jilin, P.R. China

Management system:
ISO 9001, ISO 14001, ISO 45001

Organisation no:
913304813502083466

Issue date:
03.04.2025

Valid to:
03.04.2030

Year of study:
2024.01-2024.12

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 EnviroTech Ltd

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 "Top Performer" by PVEL/DNV GL for multiple times, 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.

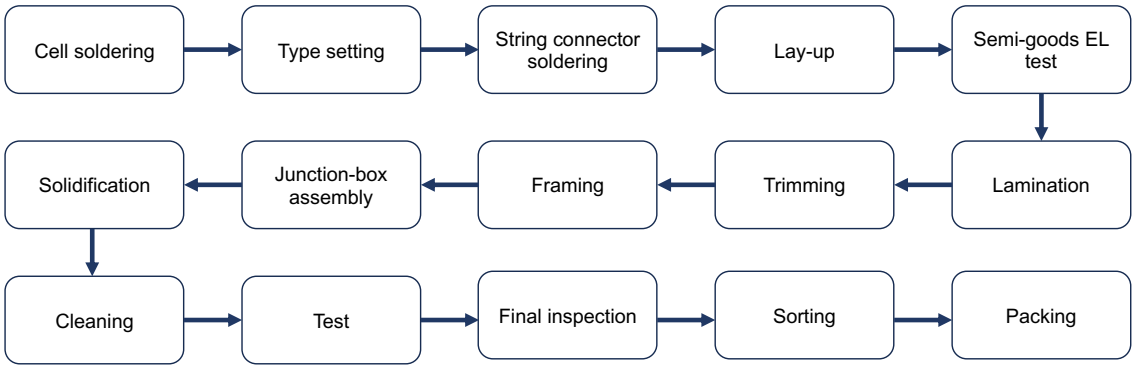
Astronergy remains unwavering in its dedication to an innovation-driven, high-quality development approach, consistently delivering superior-quality, highly reliable, and long-term stable module products to its customers. The company spares no effort in advancing the photovoltaic industry and empowering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

Product specification:

Materials compositions and technical data for the declared product are shown below. Products declared as one group share nearly the same material composition.

Materials	CHSM78RN(DG)/F-BH		CHSM48RN(DG)/F-BH CHSM48RN(DG)(BLH)/F-BH CHSM48RN(DGT)(BLH)/F-BH		CHSM54RN(DG)/F-BH CHSM54RN(DG)(BLH)/F-BH	
	kg/FU	%	kg/FU	%	kg/FU	%
Frame	3.52E-03	6.41%	3.96E-03	7.61%	3.80E-03	6.81%
Glass	4.34E-02	79.03%	3.94E-02	75.85%	4.35E-02	78.10%
Cell	1.19E-03	2.16%	1.19E-03	2.29%	1.19E-03	2.14%
Solder	2.70E-04	0.49%	2.95E-04	0.57%	3.03E-04	0.54%
Busbar	6.24E-05	0.11%	8.69E-05	0.17%	7.75E-05	0.14%
EVA	3.49E-03	6.36%	3.74E-03	7.20%	3.70E-03	6.64%
PET	2.96E-05	0.05%	0.00E+00	0.00%	0.00E+00	0.00%
Junction box	1.54E-04	0.28%	2.45E-04	0.47%	2.18E-04	0.39%
Flux	4.00E-05	0.07%	2.20E-05	0.04%	4.59E-07	0.001%
Silicone	5.00E-04	0.91%	6.06E-04	1.17%	5.74E-04	1.03%
Tape	3.38E-05	0.06%	2.77E-05	0.05%	3.86E-05	0.07%
Tag	1.00E-06	0.002%	1.63E-06	0.003%	1.45E-06	0.003%
Ribbon	2.70E-07	0.0005%	4.40E-07	0.001%	3.99E-07	0.001%
Packaging film	3.66E-05	0.07%	4.13E-05	0.08%	3.57E-05	0.06%
Packaging bag	8.44E-05	0.15%	9.98E-05	0.19%	8.98E-05	0.16%
Pallet	1.59E-03	2.89%	1.75E-03	3.36%	1.68E-03	3.02%
Paper	4.66E-05	0.08%	4.88E-05	0.09%	4.85E-05	0.09%
Bead	2.91E-05	0.05%	3.45E-05	0.07%	3.07E-05	0.06%
Cover	1.05E-04	0.19%	1.10E-04	0.21%	1.09E-04	0.20%
Packaging frame	3.35E-04	0.61%	3.05E-04	0.59%	3.03E-04	0.54%

Description of production processes:



Step 1: Cell soldering

Solar cells are heated using infrared tubes, transferring thermal energy to fuse soldering ribbons with the cell surfaces.

Step 2: Typesetting/ soldering/ lay up

Glass, EVA, cell strings are automatically laid up, with tape to fix the cell strings, adhesive tape to secure the strings while cross connectors soldered to form electrical circuits. Subsequent layers of EVA and backsheet are added, followed by the application of a serial number (SN) label. Process data is recorded in the AMES system for traceability.

Step 3: Semi-goods EL Test

The SN label is scanned, and electroluminescence (EL) imaging is performed. Operators analyze EL images against predefined quality standards, supported by AI-driven defect detection algorithms.

Step 4: Lamination

Semi-finished modules are automatically fed into laminators. Four modules are processed per batch, regardless of 72pcs or 54pcs cells.

Step 5: Trimming

Excess material is removed from module edges to ensure dimensional uniformity and smoothness.

Step 6: Framing

Aluminum frames are positioned on the module perimeter. Silicone gel is injected into frame grooves, and robotic arms apply controlled pressure to bond frames securely.

Step 7: J-Box Assemble

A junction box (J-Box) is affixed to the module using automated glue dispensing. The silicone application ensures a smooth, waterproof interface between the J-Box and backsheet.

Step 8: J-Box glue

AB gel is injected into the J-Box cavity. Upon curing, the gel provides humidity resistance and electrical insulation for internal components.

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

The modules undergo simulated sunlight exposure using xenon lamps under standardized conditions (e.g., AM1.5 spectrum). Power output data is recorded and printed on backsheet labels.

Step 12: Final EL Test

A secondary EL test identifies micro-cracks, contact defects, or shunts, ensuring compliance with electrical performance criteria.

Step13: Final Inspection

Inspectors conduct visual examinations, verify EL test results, and confirm dimensional specifications. AI tools assist in defect classification and decision-making.

Step 14: Sorting

Modules are sorted automatically based on power ratings, current outputs, color consistency, and quality grades.

Step 15: Packing

Modules which have passed the final inspection are palletized, rotated to predefined orientations (90° or 180°), and encased in protective packaging. Vertical packing configurations are standard.

Step 16: Entering warehouse

Packaged modules are transported to storage facilities, ready for distribution to end 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 (%)
CHSM78RN(DG)/F-BH	715-740	2465*1303*33	3.21	22.3~23.0	38.9	1	0.4
CHSM48RN(DG)/F-BH	440-460	1762*1134*30	2.00	22.0~23.0	22.9	1	0.4
CHSM48RN(DG)(BLH)/F-BH	435-455	1762*1134*30	2.00	21.8~22.8	22.9	1	0.4
CHSM48RN(DGT)(BLH)/F-BH	435-455	1762*1134*30	2.00	21.8~22.8	22.9	1	0.4
CHSM54RN(DG)/F-BH	495-515	1961*1134*30	2.22	22.3~23.2	27.4	1	0.4
CHSM54RN(DGT)(BLH)/F-BH	490-510	1961*1134*30	2.22	22.0~22.9	27.4	1	0.4

Geographical area:

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

Reference service life, product:

25 years (≥80% of the labelled power output)

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 (⩾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:

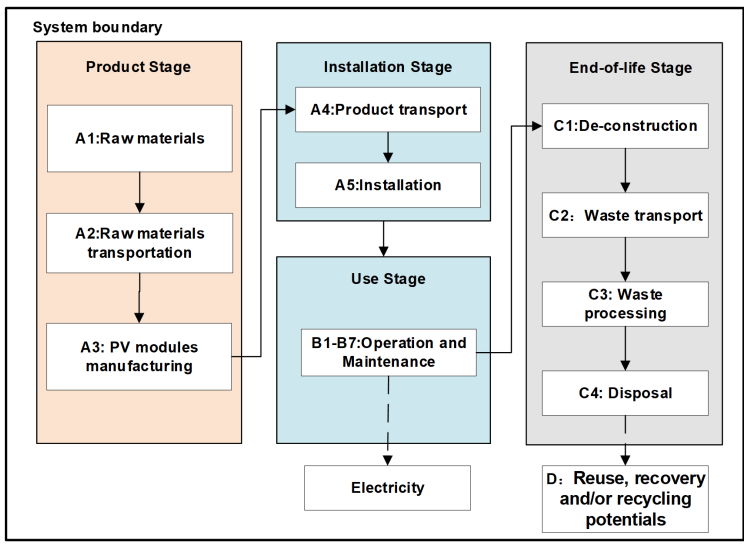
Primary data (such as materials or energy flows that enter and leave the production system) is from Astronergy manufacturing facilities for the period spanning from Jan. 2024 to Dec. 2024 (annual average). Generic data related to the life cycle impacts of the material or energy flows that enter and leave the production system is sourced from Ecoinvent 3.10 "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 (Within China)	36.7	1000	Diesel	kg/tkm	0.0366
Ship (to Europe)	70	18000	Heavy fuel oil	kg/tkm	0.0025
Truck (Within Europe)	36.7	300	Diesel	kg/tkm	0.0366

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	1.03E-3~1.08E-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	m3/FU	1.55E-5-2.53E-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:

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

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, m^2.

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/m^2, 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:

$$E_2 = E_1 * (1 - \text{deg})$$

Energy production n year of operation:

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

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	CHSM78RN(DG)/F-BH	CHSM48RN(DG)/F-BH CHSM48RN(DG)(BLH)/F-BH CHSM48RN(DGT)(BLH)/F-BH	CHSM54RN(DG)/F-BH CHSM54RN(DGT)(BLH)/F-BH
Hazardous waste disposed	kg/FU	-	-	-
Collected as mixed construction waste	kg/FU	5.26E-02	4.73E-02	5.37E-02
Reuse	kg/FU	-	-	-
Recycling	kg/FU	4.22E-02	3.70E-02	4.31E-02
Energy recovery	kg/FU	3.67E-03	3.99E-03	3.92E-03
To landfill	kg/FU	6.72E-03	6.22E-03	6.74E-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	CHSM78RN(DG)/F-BH	CHSM48RN(DG)/F-BH CHSM48RN(DG)(BLH)/F-BH CHSM48RN(DGT)(BLH)/F-BH	CHSM54RN(DG)/F-BH CHSM54RN(DGT)(BLH)/F-BH
Substitution of electricity	MJ/FU	2.22E-02	2.36E-02	2.33E-02
Substitution of thermal energy, district heating	MJ/FU	4.26E-02	4.53E-02	4.45E-02
Substitution of aluminum with net scrap	kg/FU	9.15E-04	1.03E-03	9.86E-04
Substitution of primary silver with net scrap	kg/FU	9.19E-06	9.23E-06	9.22E-06
Substitution of primary copper with net scrap	kg/FU	5.94E-05	7.99E-05	7.29E-05
Substitution of primary glass with glass gullets	kg/FU	3.13E-02	2.85E-02	3.15E-02
Substitution of primary wood pallet with recycled wood	kg/FU	1.02E-03	1.17E-03	1.04E-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 9.6.

Core environmental impact indicators

CHSM78RN(DG)/F-BH (740Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP - total	kg CO_2 eq	3.61E-01	2.38E-02	4.81E-03	0.00E+00	1.99E-05	0.00E+00	1.37E-03	5.04E-04	9.33E-03	5.24E-04	-9.53E-02
GWP - fossil	kg CO_2 eq	3.64E-01	2.38E-02	1.77E-03	0.00E+00	1.98E-05	0.00E+00	1.37E-03	5.04E-04	9.33E-03	5.24E-04	-9.52E-02
GWP - biogenic	kg CO_2 eq	-3.04E-03	0.00E+00	3.04E-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
GWP - luluc	kg CO_2 eq	2.89E-04	1.06E-05	2.39E-07	0.00E+00	1.63E-08	0.00E+00	1.80E-07	2.05E-07	8.57E-07	5.02E-08	-1.14E-04
ODP	kg CFC11 eq	4.29E-09	3.64E-10	2.34E-11	0.00E+00	3.59E-12	0.00E+00	2.10E-11	7.46E-12	9.41E-11	2.37E-12	-1.34E-09
AP	molc H+ eq	2.16E-03	3.34E-04	1.28E-05	0.00E+00	1.03E-07	0.00E+00	1.23E-05	1.15E-06	3.04E-05	7.49E-07	-5.28E-04
EP- freshwater	kg P eq	1.23E-05	1.61E-07	8.42E-09	0.00E+00	7.45E-10	0.00E+00	6.70E-09	4.67E-09	3.39E-07	1.85E-09	-4.88E-06
EP -marine	kg N eq	4.49E-04	8.40E-05	5.83E-06	0.00E+00	1.93E-08	0.00E+00	5.65E-06	2.61E-07	5.93E-06	2.74E-07	-1.15E-04
EP - terrestrial	molc N eq	4.74E-03	9.33E-04	6.39E-05	0.00E+00	2.15E-07	0.00E+00	6.20E-05	2.89E-06	6.75E-05	2.96E-06	-1.31E-03
POCP	kg NMVOC eq	1.40E-03	2.75E-04	1.91E-05	0.00E+00	6.55E-08	0.00E+00	1.85E-05	1.62E-06	1.96E-05	9.82E-07	-3.78E-04
ADP-M&M[2]	kg Sb-Eq	2.27E+00	2.37E-02	1.32E-03	0.00E+00	1.49E-04	0.00E+00	1.06E-03	6.94E-04	8.43E-02	1.79E-04	-5.20E-01
ADP-fossil[2]	MJ	2.00E-05	5.42E-08	9.81E-10	0.00E+00	8.83E-11	0.00E+00	5.26E-10	1.65E-09	1.10E-08	2.11E-10	-5.23E-05
WDP[2]	m^3	4.56E-01	1.14E-03	2.14E-04	0.00E+00	6.64E-04	0.00E+00	4.36E-05	3.22E-05	1.06E-03	-1.21E-03	-1.95E-02

CHSM48RN(DG)/F-BH, CHSM48RN(DG)(BLH)/F-BH, CHSM48RN(DGT)(BLH)/F-BH (455Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP - total	kg CO_2 eq	3.64E-01	2.15E-02	5.07E-03	0.00E+00	3.23E-05	0.00E+00	1.37E-03	4.53E-04	8.39E-03	6.60E-04	-9.24E-02
GWP - fossil	kg CO_2 eq	3.67E-01	2.15E-02	1.82E-03	0.00E+00	3.23E-05	0.00E+00	1.37E-03	4.53E-04	8.39E-03	6.60E-04	-9.23E-02
GWP - biogenic	kg CO_2 eq	-3.24E-03	0.00E+00	3.24E-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
GWP - luluc	kg CO_2 eq	3.00E-04	9.61E-06	2.45E-07	0.00E+00	2.65E-08	0.00E+00	1.80E-07	1.84E-07	7.71E-07	4.76E-08	-1.15E-04

ODP	kg CFC11 eq	4.45E-09	3.29E-10	2.36E-11	0.00E+00	5.84E-12	0.00E+00	2.10E-11	6.70E-12	8.46E-11	2.25E-12	-1.30E-09
AP	molc H+ eq	2.17E-03	3.02E-04	1.29E-05	0.00E+00	1.67E-07	0.00E+00	1.23E-05	1.04E-06	2.74E-05	7.36E-07	-5.32E-04
EP- freshwater	kg P eq	1.25E-05	1.46E-07	8.59E-09	0.00E+00	1.21E-09	0.00E+00	6.70E-09	4.20E-09	3.05E-07	1.82E-09	-4.81E-06
EP -marine	kg N eq	4.50E-04	7.61E-05	5.84E-06	0.00E+00	3.14E-08	0.00E+00	5.65E-06	2.34E-07	5.33E-06	2.72E-07	-1.12E-04
EP - terrestrial	molc N eq	4.75E-03	8.45E-04	6.40E-05	0.00E+00	3.50E-07	0.00E+00	6.20E-05	2.60E-06	6.07E-05	2.93E-06	-1.28E-03
POCP	kg NMVOC eq	1.41E-03	2.49E-04	1.92E-05	0.00E+00	1.07E-07	0.00E+00	1.85E-05	1.45E-06	1.77E-05	9.56E-07	-3.70E-04
ADP-M&M[2]	kg Sb-Eq	2.31E+00	2.15E-02	1.34E-03	0.00E+00	2.43E-04	0.00E+00	1.06E-03	6.24E-04	7.58E-02	1.73E-04	-5.04E-01
ADP-fossil[2]	MJ	2.08E-05	4.91E-08	1.03E-09	0.00E+00	1.44E-10	0.00E+00	5.26E-10	1.48E-09	9.85E-09	2.04E-10	-5.27E-05
WDP[2]	m³	4.58E-01	1.03E-03	2.40E-04	0.00E+00	1.08E-03	0.00E+00	4.36E-05	2.89E-05	9.55E-04	-1.11E-03	-1.87E-02

CHSM54RN(DG)/F-BH, CHSM54RN(DGT)(BLH)/F-BH (510Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP - total	kg CO_2 eq	3.68E-01	2.43E-02	4.93E-03	0.00E+00	2.88E-05	0.00E+00	1.37E-03	5.15E-04	9.54E-03	6.05E-04	-9.70E-02
GWP - fossil	kg CO_2 eq	3.70E-01	2.43E-02	1.78E-03	0.00E+00	2.88E-05	0.00E+00	1.37E-03	5.15E-04	9.54E-03	6.05E-04	-9.69E-02
GWP - biogenic	kg CO_2 eq	-3.14E-03	0.00E+00	3.14E-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
GWP - luluc	kg CO_2 eq	2.97E-04	1.08E-05	2.42E-07	0.00E+00	2.37E-08	0.00E+00	1.80E-07	2.09E-07	8.76E-07	5.09E-08	-1.18E-04
ODP	kg CFC11 eq	4.45E-09	3.72E-10	2.35E-11	0.00E+00	5.21E-12	0.00E+00	2.10E-11	7.62E-12	9.62E-11	2.41E-12	-1.36E-09
AP	molc H+ eq	2.20E-03	3.41E-04	1.28E-05	0.00E+00	1.49E-07	0.00E+00	1.23E-05	1.18E-06	3.11E-05	7.69E-07	-5.46E-04
EP- freshwater	kg P eq	1.25E-05	1.64E-07	8.49E-09	0.00E+00	1.08E-09	0.00E+00	6.70E-09	4.77E-09	3.46E-07	1.88E-09	-4.95E-06
EP -marine	kg N eq	4.57E-04	8.59E-05	5.83E-06	0.00E+00	2.80E-08	0.00E+00	5.65E-06	2.66E-07	6.06E-06	2.83E-07	-1.16E-04
EP - terrestrial	molc N eq	4.82E-03	9.54E-04	6.39E-05	0.00E+00	3.12E-07	0.00E+00	6.20E-05	2.96E-06	6.90E-05	3.06E-06	-1.33E-03
POCP	kg NMVOC eq	1.43E-03	2.81E-04	1.92E-05	0.00E+00	9.51E-08	0.00E+00	1.85E-05	1.65E-06	2.01E-05	1.01E-06	-3.85E-04
ADP-M&M[2]	kg Sb-Eq	2.31E+00	2.43E-02	1.33E-03	0.00E+00	2.16E-04	0.00E+00	1.06E-03	7.09E-04	8.62E-02	1.83E-04	-5.30E-01
ADP-fossil[2]	MJ	2.10E-05	5.54E-08	1.00E-09	0.00E+00	1.28E-10	0.00E+00	5.26E-10	1.68E-09	1.12E-08	2.15E-10	-5.26E-05
WDP[2]	m³	4.59E-01	1.16E-03	2.24E-04	0.00E+00	9.63E-04	0.00E+00	4.36E-05	3.29E-05	1.09E-03	-1.21E-03	-1.96E-02

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

CHSM78RN(DG)/F-BH (740Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	Disease incidence	2.59E-08	1.33E-09	3.55E-10	0.00E+00	1.29E-12	0.00E+00	3.46E-10	3.73E-11	2.72E-10	1.41E-11	-4.88E-09
IRP1	kBq U235 eq.	7.86E-03	9.05E-05	8.29E-06	0.00E+00	6.60E-07	0.00E+00	7.35E-06	2.31E-06	4.18E-04	7.25E-07	-2.24E-03
ETP-fw2	CTUe	2.92E+00	7.27E-02	1.33E-02	0.00E+00	1.59E-04	0.00E+00	2.56E-03	1.90E-03	1.88E-01	1.71E-03	-7.72E-01
HTP-c2	CTUh	2.10E-09	1.20E-10	6.20E-12	0.00E+00	3.13E-13	0.00E+00	5.31E-12	2.65E-12	5.24E-10	5.83E-13	-2.86E-10
HTP-nc2	CTUh	3.07E-09	1.50E-10	6.55E-12	0.00E+00	5.71E-13	0.00E+00	2.34E-12	4.44E-12	4.53E-11	2.09E-12	-2.96E-08
SQP2	Dimensionless	1.53E+00	1.25E-01	2.24E-03	0.00E+00	4.91E-05	0.00E+00	1.32E-03	4.29E-03	1.71E-02	4.48E-03	-6.09E-01

CHSM48RN(DG)/F-BH, CHSM48RN(DG)(BLH)/F-BH, CHSM48RN(DGT)(BLH)/F-BH (455Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	Disease incidence	2.62E-08	1.21E-09	3.56E-10	0.00E+00	2.10E-12	0.00E+00	3.46E-10	3.36E-11	2.45E-10	1.32E-11	-4.88E-09
IRP[1]	kBq U235 eq.	7.95E-03	8.20E-05	8.40E-06	0.00E+00	1.07E-06	0.00E+00	7.35E-06	2.07E-06	3.76E-04	6.93E-07	-2.08E-03
ETP-fw[2]	CTUe	2.95E+00	6.59E-02	1.50E-02	0.00E+00	2.58E-04	0.00E+00	2.56E-03	1.71E-03	1.69E-01	1.95E-03	-7.60E-01
HTP-c[2]	CTUh	2.14E-09	1.09E-10	6.26E-12	0.00E+00	5.09E-13	0.00E+00	5.31E-12	2.38E-12	4.71E-10	5.79E-13	-2.79E-10
HTP-nc[2]	CTUh	3.28E-09	1.36E-10	6.80E-12	0.00E+00	9.29E-13	0.00E+00	2.34E-12	3.99E-12	4.07E-11	2.48E-12	-2.99E-08
SQP[2]	Dimensionless	1.57E+00	1.14E-01	2.32E-03	0.00E+00	7.99E-05	0.00E+00	1.32E-03	3.85E-03	1.54E-02	4.15E-03	-5.85E-01

CHSM54RN(DG)/F-BH, CHSM54RN(DGT)(BLH)/F-BH (510Wp)

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	Disease incidence	2.65E-08	1.36E-09	3.56E-10	0.00E+00	1.87E-12	0.00E+00	3.46E-10	3.82E-11	2.78E-10	1.42E-11	-5.01E-09
IRP[1]	kBq U235 eq.	7.97E-03	9.25E-05	8.34E-06	0.00E+00	9.57E-07	0.00E+00	7.35E-06	2.36E-06	4.27E-04	7.38E-07	-2.25E-03
ETP-fw[2]	CTUe	2.98E+00	7.44E-02	1.40E-02	0.00E+00	2.30E-04	0.00E+00	2.56E-03	1.94E-03	1.92E-01	1.88E-03	-7.78E-01
HTP-c[2]	CTUh	2.14E-09	1.23E-10	6.22E-12	0.00E+00	4.54E-13	0.00E+00	5.31E-12	2.70E-12	5.36E-10	6.03E-13	-2.88E-10
HTP-nc[2]	CTUh	3.24E-09	1.54E-10	6.61E-12	0.00E+00	8.29E-13	0.00E+00	2.34E-12	4.53E-12	4.63E-11	2.33E-12	-2.98E-08
SQP[2]	Dimensionless	1.57E+00	1.28E-01	2.28E-03	0.00E+00	7.13E-05	0.00E+00	1.32E-03	4.38E-03	1.75E-02	4.50E-03	-6.14E-01

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

CHSM78RN(DG)/F-BH (740Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
RPEE	MJ	8.76E-01	3.65E-03	2.70E-04	0.00E+00	2.24E-05	0.00E+00	2.21E-04	9.45E-05	3.57E-03	2.82E-02	-1.53E-01
RPEM	MJ	2.82E-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	-2.82E-02	0.00E+00
TPE	MJ	9.04E-01	3.65E-03	2.70E-04	0.00E+00	2.24E-05	0.00E+00	2.21E-04	9.45E-05	3.57E-03	3.02E-05	-1.53E-01
NRPE	MJ	2.92E+00	3.12E-02	1.35E-01	0.00E+00	1.88E-04	0.00E+00	1.00E-03	9.47E-04	1.07E-01	2.31E-04	-6.42E-01
NRPM	MJ	1.33E-01	0.00E+00	-1.33E-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	3.05E+00	3.12E-02	1.34E-03	0.00E+00	1.88E-04	0.00E+00	1.00E-03	9.47E-04	1.07E-01	2.31E-04	-6.42E-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	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	3.54E-05	7.68E-06	0.00E+00	1.55E-05	0.00E+00	1.66E-06	9.72E-07	8.03E-05	-2.80E-05	-1.32E-03

CHSM48RN(DG)/F-BH, CHSM48RN(DG)(BLH)/F-BH, CHSM48RN(DGT)(BLH)/F-BH (455Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
RPEE	MJ	8.83E-01	3.31E-03	2.76E-04	0.00E+00	3.65E-05	0.00E+00	2.21E-04	8.50E-05	3.21E-03	3.01E-02	-1.47E-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	9.14E-01	3.31E-03	2.76E-04	0.00E+00	3.65E-05	0.00E+00	2.21E-04	8.50E-05	3.21E-03	2.92E-05	-1.47E-01
NRPE	MJ	2.96E+00	2.83E-02	1.46E-01	0.00E+00	3.06E-04	0.00E+00	1.00E-03	8.52E-04	9.66E-02	2.24E-04	-6.31E-01
NRPM	MJ	1.45E-01	0.00E+00	-1.45E-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	3.10E+00	2.83E-02	1.37E-03	0.00E+00	3.06E-04	0.00E+00	1.00E-03	8.52E-04	9.66E-02	2.24E-04	-6.31E-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	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	3.21E-05	8.61E-06	0.00E+00	2.52E-05	0.00E+00	1.66E-06	8.73E-07	7.22E-05	-2.56E-05	-1.30E-03

CHSM54RN(DG)/F-BH, CHSM54RN(DGT)(BLH)/F-BH (510Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
RPEE	MJ	8.84E-01	3.73E-03	2.73E-04	0.00E+00	3.26E-05	0.00E+00	2.21E-04	9.66E-05	3.64E-03	2.92E-02	-1.54E-01
RPEM	MJ	2.91E-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	-2.91E-02	0.00E+00
TPE	MJ	9.14E-01	3.73E-03	2.73E-04	0.00E+00	3.26E-05	0.00E+00	2.21E-04	9.66E-05	3.64E-03	3.09E-05	-1.54E-01
NRPE	MJ	2.96E+00	3.19E-02	1.44E-01	0.00E+00	2.73E-04	0.00E+00	1.00E-03	9.68E-04	1.10E-01	2.37E-04	-6.57E-01
NRPM	MJ	1.42E-01	0.00E+00	-1.42E-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	3.10E+00	3.19E-02	1.35E-03	0.00E+00	2.73E-04	0.00E+00	1.00E-03	9.68E-04	1.10E-01	2.37E-04	-6.57E-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	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	1.20E-02	3.62E-05	8.05E-06	0.00E+00	2.25E-05	0.00E+00	1.66E-06	9.93E-07	8.21E-05	-2.80E-05	-1.33E-03

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

CHSM78RN(DG)/F-BH (740Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HW	kg	7.09E-04	1.95E-06	1.39E-07	0.00E+00	9.40E-10	0.00E+00	1.23E-07	4.89E-08	1.67E-07	1.43E-08	1.97E-05
NHW	kg	1.56E-02	9.38E-03	1.02E-04	0.00E+00	1.44E-06	0.00E+00	1.18E-05	3.39E-04	4.21E-02	1.05E-02	-4.72E-03
RW	kg	5.22E-06	5.79E-08	6.03E-09	0.00E+00	4.04E-10	0.00E+00	5.41E-09	1.44E-09	2.94E-07	4.63E-10	-1.44E-06

CHSM48RN(DG)/F-BH, CHSM48RN(DG)(BLH)/F-BH, CHSM48RN(DGT)(BLH)/F-BH (455Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HW	kg	7.12E-04	1.77E-06	1.41E-07	0.00E+00	1.53E-09	0.00E+00	1.23E-07	4.40E-08	1.50E-07	1.36E-08	2.31E-05
NHW	kg	1.55E-02	8.50E-03	1.11E-04	0.00E+00	2.34E-06	0.00E+00	1.18E-05	3.05E-04	4.00E-02	1.03E-02	-4.43E-03
RW	kg	5.28E-06	5.25E-08	6.10E-09	0.00E+00	6.57E-10	0.00E+00	5.41E-09	1.29E-09	2.64E-07	4.44E-10	-1.34E-06

CHSM54RN(DG)/F-BH, CHSM54RN(DGT)(BLH)/F-BH (510Wp)

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HW	kg	7.13E-04	2.00E-06	1.40E-07	0.00E+00	1.36E-09	0.00E+00	1.23E-07	5.00E-08	1.71E-07	1.45E-08	2.17E-05
NHW	kg	1.59E-02	9.59E-03	1.06E-04	0.00E+00	2.09E-06	0.00E+00	1.18E-05	3.47E-04	4.29E-02	1.08E-02	-4.75E-03
RW	kg	5.29E-06	5.92E-08	6.06E-09	0.00E+00	5.86E-10	0.00E+00	5.41E-09	1.47E-09	3.00E-07	4.72E-10	-1.45E-06

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

End of life – output flow

CHSM78RN(DG)/F-BH (740Wp)

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	1.19E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.21E-02	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	9.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.67E-03	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	2.24E-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	4.25E-02	0.00E+00

CHSM48RN(DG)/F-BH, CHSM48RN(DG)(BLH)/F-BH, CHSM48RN(DGT)(BLH)/F-BH (455Wp)

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	1.31E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-02	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	9.35E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.99E-03	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	3.37E-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	6.32E-02	0.00E+00

CHSM54RN(DG)/F-BH, CHSM54RN(DGT)(BLH)/F-BH (510Wp)

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	1.26E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E-02	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	9.12E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.92E-03	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	2.63E-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	5.00E-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	CHSM78RN(DG)/F-BH	CHSM48RN(DG)/F-BH CHSM48RN(DG)(BLH)/F-BH CHSM48RN(DGT)(BLH)/F-BH	CHSM54RN(DG)/F-BH CHSM54RN(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	8.29E-04	8.85E-04	8.58E-04

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

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	GWP [kg CO_2 -eq/kWh]
Electricity, medium voltage {CN-ECGC}| market for electricity, medium voltage | Cut-off, U	ecoinvent 3.10	0.857
Electricity, medium voltage {CN-NCGC}| market for electricity, medium voltage | Cut-off, U	ecoinvent 3.10	1.17

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
CHSM78RN(DG)/F-BH (740 Wp)	kg CO_2 eq	3.64E-01	2.38E-02	1.77E-03	0.00E+00	1.99E-05	0.00E+00	1.37E-03	5.04E-04	9.33E-03	5.24E-04	-9.53E-02

CHSM48RN(DG)/F-BH (455 Wp) CHSM48RN(DG)(BLH)/F-BH (455 Wp) CHSM48RN(DGT)(BLH)/F-BH (455 Wp)	kg CO_2 eq	3.67E-01	2.15E-02	1.82E-03	0.00E+00	3.23E-05	0.00E+00	1.37E-03	4.53E-04	8.39E-03	6.60E-04	-9.24E-02
CHSM54RN(DG)/F-BH (510 Wp) CHSM54RN(DGT)(BLH)/F-BH (510 Wp)	kg CO_2 eq	3.71E-01	2.43E-02	1.78E-03	0.00E+00	2.88E-05	0.00E+00	1.37E-03	5.15E-04	9.54E-03	6.05E-04	-9.70E-02

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)

Brand Series	Carbon footprint (per Wp)	Carbon footprint (per kWh)
CHSM78RN(DG)/F-BH (740 Wp)	4.02E-01 kg CO_2 eq	7.01E-03 kg CO_2 eq
CHSM48RN(DG)/F-BH (455 Wp) CHSM48RN(DG)(BLH)/F-BH (455 Wp) CHSM48RN(DGT)(BLH)/F-BH (455 Wp)	4.02E-01 kg CO_2 eq	7.02 E-03 kg CO_2 eq
CHSM54RN(DG)/F-BH (510 Wp) CHSM54RN(DGT)(BLH)/F-BH (510 Wp)	4.09E-01 kg CO_2 eq	7.09E-03 kg CO_2 eq

Note: the carbon footprint (per kWh) results do not include the impacts caused by electrical equipment and mounting structures, and the distribution losses.

EPD results conversion factors of various power output ranges

CHSM78RN(DG)/F-BH

Rated power output range (Wp)	715	720	725	730	735	740
Conversion factor*	1.035	1.028	1.021	1.014	1.007	1

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 740 Wp by relevant conversion factors.

CHSM48RN(DG)/F-BH

Rated power output range (Wp)	440	445	450	455	460
Conversion factor*	1.034	1.022	1.011	1.000	0.989

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 455 Wp by relevant conversion factors.

CHSM48RN(DG)(BLH)/F-BH, CHSM48RN(DGT)(BLH)/F-BH

Rated power output range (Wp)	435	440	445	450	455
Conversion factor*	1.046	1.034	1.022	1.011	1

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 455 Wp by relevant conversion factors.

CHSM54RN(DG)/F-BH

Rated power output range (Wp)	495	500	505	510	515
Conversion factor*	1.030	1.020	1.010	1.000	0.990

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 510 Wp by relevant conversion factors.

CHSM54RN(DGT)(BLH)/F-BH

Rated power output range (Wp)	490	495	500	505	510
Conversion factor*	1.041	1.030	1.020	1.010	1

*Note: Environmental impacts of other power outputs are determined by multiplying the results for 510 Wp by relevant conversion factors.

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