Project report:

8/17/2022

gjftkjfk

CONTENTS

The E-DESIGNER/Rooftop Planner allows the user to simulate PV-projects with different configurations. The given numbers/parameters (e.g. for losses) are only recommendations/approximate values and not applicable for individual project design. We recommend our Q.PARTNERs to carefully modify some parameters regarding countries ‘norms and project’s specification.

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PV Planning #1

(Planning active & Simulated)

Planning information

Roof name	Form of roof	Output (Watt)	Module count
Roof_1	Shed roof	238,095	481

Selected inverter manufacturer	Sungrow Power Supply Co., Ltd.
Selected variation	Automatic Inverter Layout 1

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Inverter Layout

Automatic Inverter Layout 1

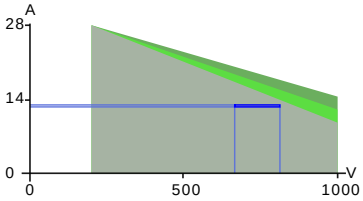
Energy Output AC	256,856 kWh
Performance Ratio	91.6 %

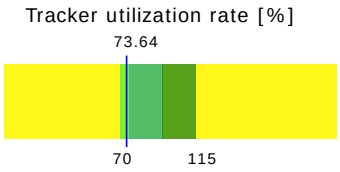
Performance ratio calculation
Use nominal power for power ratio
Calculate inverse power ratio

1 x SG110CX — Nominal power ratio: 111.2 %

Input	Amount Strings	Module/String	GF	Roof name
A	1	19	1	Roof_1
B	1	19	1	Roof_1
C	1	19	1	Roof_1
D	2	19	1	Roof_1
E	2	19	1	Roof_1
F	2	19	1	Roof_1
G	1	19	1	Roof_1
H	2	19	1	Roof_1
I	1	19	1	Roof_1

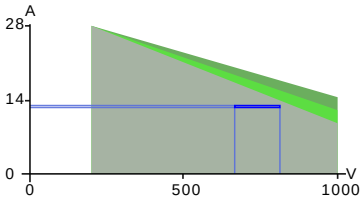
Input A

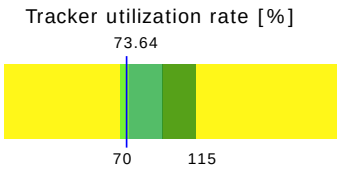




Tracker power portion 7.69 %

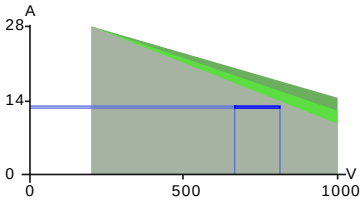
Input B

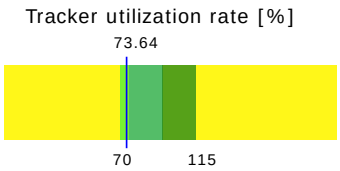




Tracker power portion 7.69 %

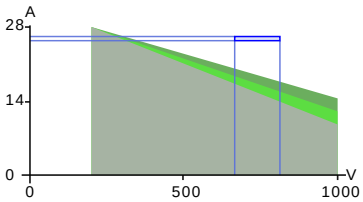
Input C

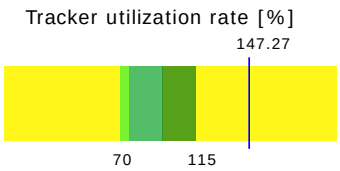




Tracker power portion 7.69 %

Input D





Tracker power portion 15.38 %

Input E

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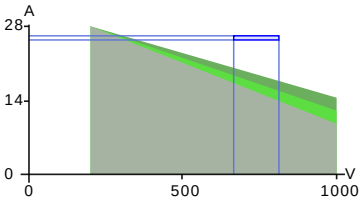
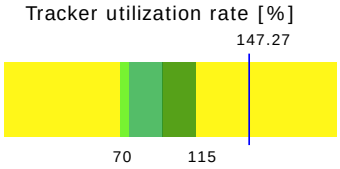
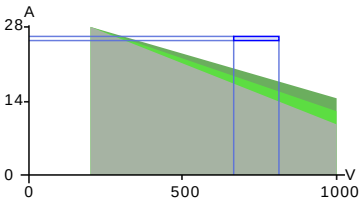
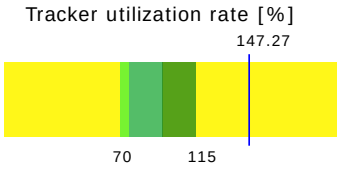




Tracker power portion 15.38 %

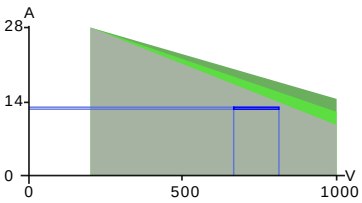
Input F

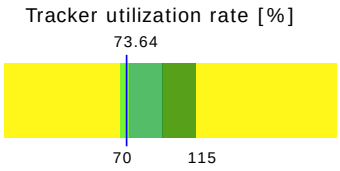




Tracker power portion 15.38 %

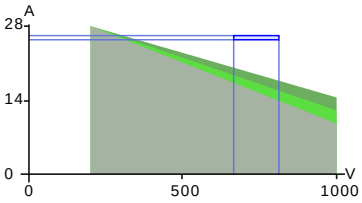
Input G

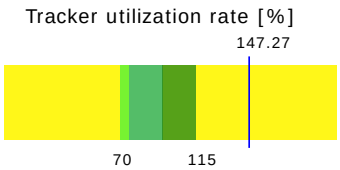




Tracker power portion 7.69 %

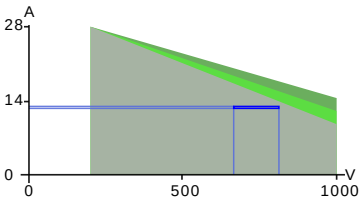
Input H

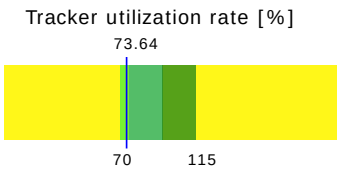




Tracker power portion 15.38 %

Input I





Tracker power portion 7.69 %

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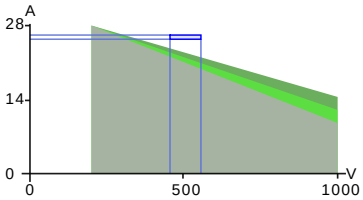
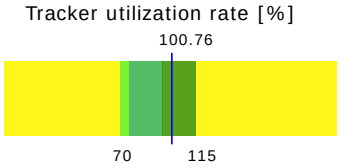
Inverter Layout

1 x SG110CX — Nominal power ratio: 105.3 %

Input	Amount Strings	Module/String	GF	Roof name
A	2	13	1	Roof_1
B	2	13	1	Roof_1
C	2	13	1	Roof_1
D	2	13	1	Roof_1
E	2	13	1	Roof_1
F	2	13	1	Roof_1
G	2	13	1	Roof_1
H	2	13	1	Roof_1
I	2	13	1	Roof_1

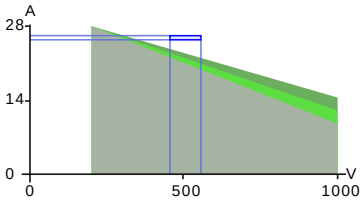
Input A

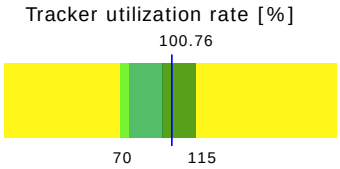




Tracker power portion 11.11 %

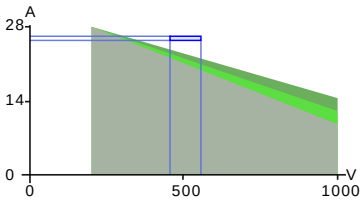
Input B

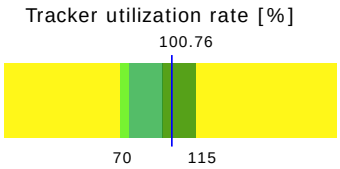




Tracker power portion 11.11 %

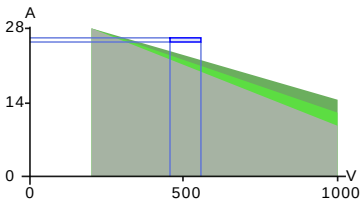
Input C

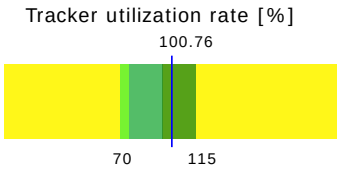




Tracker power portion 11.11 %

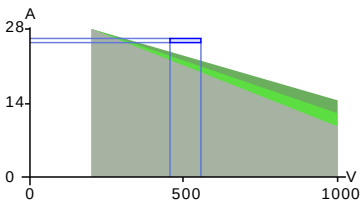
Input D

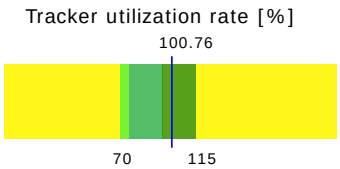




Tracker power portion 11.11 %

Input E





Tracker power portion 11.11 %

Input F

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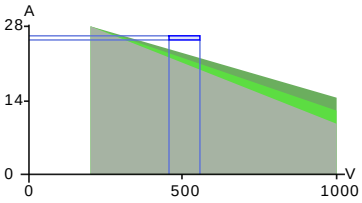
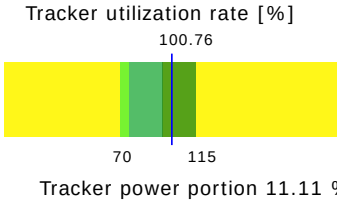
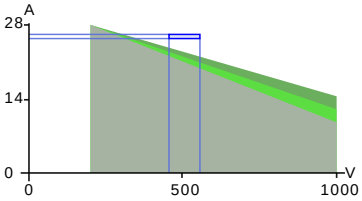
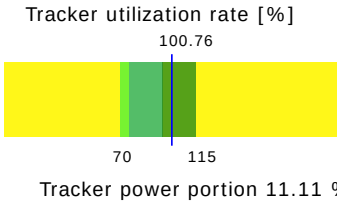




Tracker power portion 11.11 %

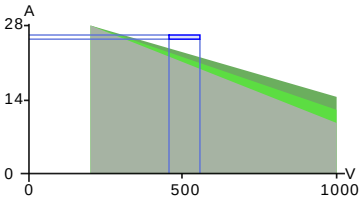
Input G

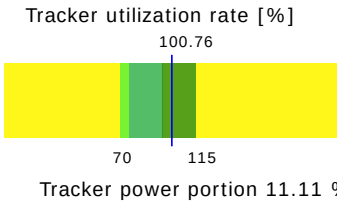




Tracker power portion 11.11 %

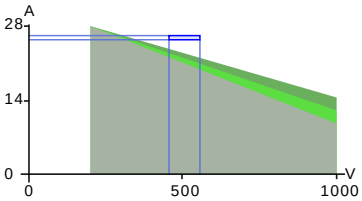
Input H

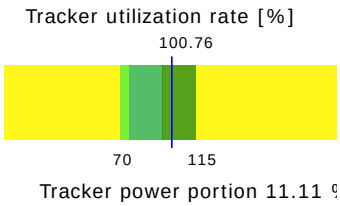




Tracker power portion 11.11 %

Input I





Tracker power portion 11.11 %

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Inverter check

SG110CX

Check

Supports 50 Hz	✓

Input A	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	13 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input B	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	13 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input C	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	13 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input D	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input E	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input F	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input G	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓

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Check		
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	13 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input H	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

Input I	Value	Limit value
Min. MPP voltage 56 °C	665 V	200 V ✓
Max. MPP voltage -19 °C	812 V	1000 V ✓
Max. Input Voltage -19 °C	970 V	1100 V ✓
Max. input current 56 °C	13 A	28 A ✓
Max. system voltage	970 V	1100 V ✓

The open circuit voltage of the string is compared with the lowest system voltage limit of a component.

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Inverter check

SG110CX

Check

Supports 50 Hz	✓

Input A	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input B	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input C	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input D	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input E	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input F	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input G	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓

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Check		
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input H	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

Input I	Value	Limit value
Min. MPP voltage 56 °C	455 V	200 V ✓
Max. MPP voltage -19 °C	556 V	1000 V ✓
Max. Input Voltage -19 °C	664 V	1100 V ✓
Max. input current 56 °C	26 A	28 A ✓
Max. system voltage	664 V	1100 V ✓

The open circuit voltage of the string is compared with the lowest system voltage limit of a component.

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Yield values

Photovoltaic system	
PV generator power Nominal power of all modules according to STC (standard test conditions)	238.10 kW
Peak performance of the PV system Maximum value of the energy production of the inverters (AC) from active power	207,910.61 W
Yield Photovoltaics DC Energy production of the photovoltaic modules (DC).	261,760.22 kWh
Specific annual yield Energy production of the inverter per kWp .	1,078.80 kWh/kWp/a
Plant utilization rate (performance ratio) Relationship between the actual and theoretical possible energy yield of the system	91.64 %
PV energy yield (AC grid) Amount of energy at the grid feed-in point in the first year	256,856.38 kWh
PV generator area total gross area of all PV modules	1,120.36 m²
Avoided CO^2 emissions based on the CO^2 emissions that would normally be emitted by gray electricity production without PV energy yield	154,113.83 kg

Energy flow	
To external grid PV energy yield (AC grid) minus self-consumption	256,856.38 kWh

Irradiation/Climate data	
Standard outdoor temperature The lowest average external temperature in two days, that is reached or exceeded 10 times in 20 years.	-20.00 °C
Global irradiation, annual sum Global irradiation on the horizontal plane.	1,059.87 kWh/m²
Global radiation - interpolation stations Global radiation - interpolation stations	Vaexjoe / Kronoberg, S, Visby Airp., VAXJO/KRONOBERG, Zoseni
Air temperature - interpolation stations Air temperature - interpolation stations	Liepaja, Palanga, Klaipeda
Meteonorm version Meteonorm version	8.1.2.15989
Meteonorm build date The date on which the Meteonorm API was created (compiled).	2022-07-08
Meteonorm year Shows a sample year as a placeholder. The year 2005 is the mean of the period 1996-2015 on which the data are based.	2005

Inverter Details

SG110CX (Sungrow Power Supply Co., Ltd.)

Max. efficiency	98.70 %	European efficiency	98.50 %
Transformator	False	String fuse	False
Indoor mounting	True	Outdoor installation	True

AC

Nominal Power AC (kVA)	110,000	Amount Phases	3
Min. Voltage AC (V)	320	Max Voltage AC (V)	460
Nominal AC current [A]	158.8	Nominal AC voltage [V]	400
Supports 50 Hz	True	Supports 60 Hz	True

DC

Max Power DC (kW)	115,000	Nominal DC voltage [V]	585
Minimum voltage DC [V]	0	Max DC (V)	1,100
Min. MPP Voltage (V)	200	Max. MPP Voltage (V)	1,000
Amount MPP-Tracker	9	Max. Electricity DC (I)	28
Tracker Type 2: Amount MPP-Tracker	0	Max dc current (tracker type 2) [A]	888.8
Input start voltage [V]	0		

Modul Details

Roof_1

Manufacturer:	Hanwha Q CELLS GmbH
Name	Q.PEAK DUO ML-G11.2 495
Width [mm]:	1,134
Height [mm]:	2,054
Thickness [mm]:	32
Framing:	Aluminium
Weight (kg)	26
Nominal Power [Watt]:	495
Module Type:	
Installation:	On Both Sides
Frame color	Aluminium
Temperature coefficient [%/°C]:	-0.34
Efficiency STC:	0.213
Output voltage IMPP - 500 W /m²:	6.48
Output voltage VMPP - 500 W/m²:	37.8
Output voltage IMPP - 100 W /m²:	1.29
Output voltage VMPP - 100 W/m²:	35.7
Output current MPP - STC [A]:	12.95
Output voltage MPP - STC [V]:	38.24
Short circuit current [A]:	13.6
Open circuit voltage [V]:	45.67
Temperature coefficient Current [%/K]:	0.04
Temperature coefficient Voltage [%/K]:	-0.27
Max. System voltage EU:	1,500
Max module backcurrent [A]	
Galvanic seperation required:	No

Energy balance per year

Global Radiation - Annual Sum	1,059.87	kWh/m²
Deviation standard spectrum, ground reflection, orientation / inclination of the module level, shading, reflection of the module surface	117.30	kWh/m²
Module irradiance	1,177.16	kWh/m²
	1,177.16	kWh/m²
	x 1,120.36	m²
	= 1,318,849.50	kWh
PV global radiation	1,318,849.50	kWh
Conversion (Q.PEAK DUO ML-G11.2 495 Module Rated efficiency 21.31 %)	- 1,037,784.54	kWh
Soiling losses	- 5,413.84	kWh
PV nominal energy	275,651.12	kWh
Mismatch losses	- 1,326.39	kWh
Other losses (low-light behavior, diodes, nominal module temperature deviation, etc ...)	- 12,564.49	kWh
Energy at the inverter input	261,760.22	kWh
Inverter losses	- 2,712.03	kWh
Cable losses	- 2,191.82	kWh
Income photovoltaic AC	256,856.38	kWh
To external grid	256,856.38	kWh
Specific annual yield	1,078.80	kWh/kWp/a
Performance Ratio	91.64	%

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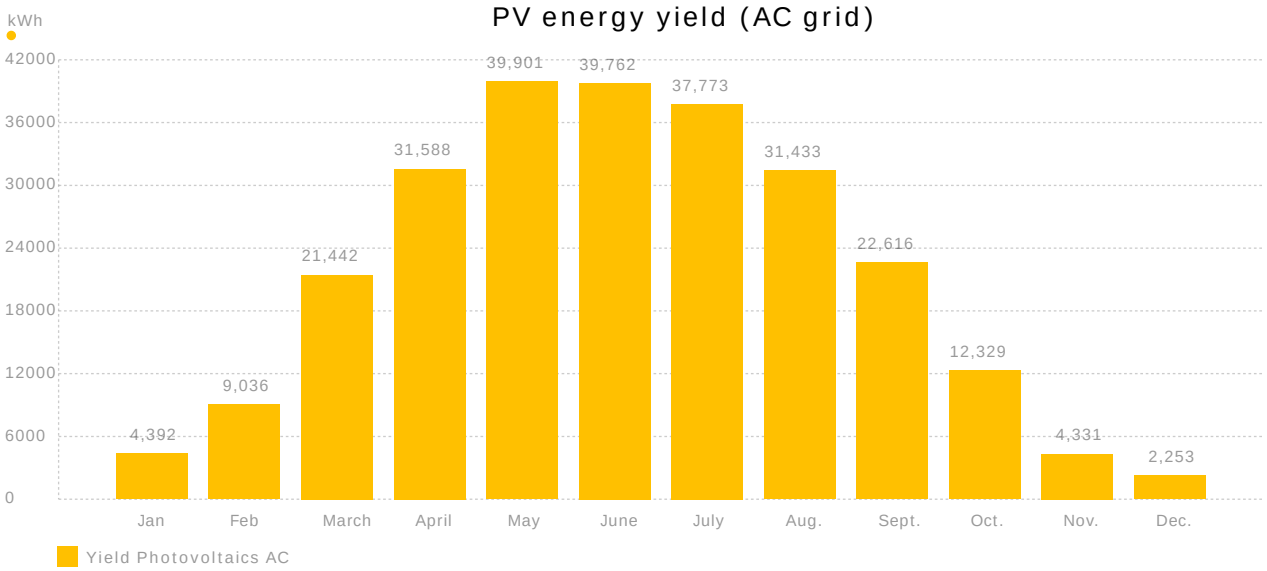

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
4,392.45	9,035.85	21,442.46	31,588.44	39,900.89	39,762.43	37,772.84	31,433.04	22,616.00	12,328.71	4,330.65	2,252.59	256,856.38	Yield Photovoltaics AC

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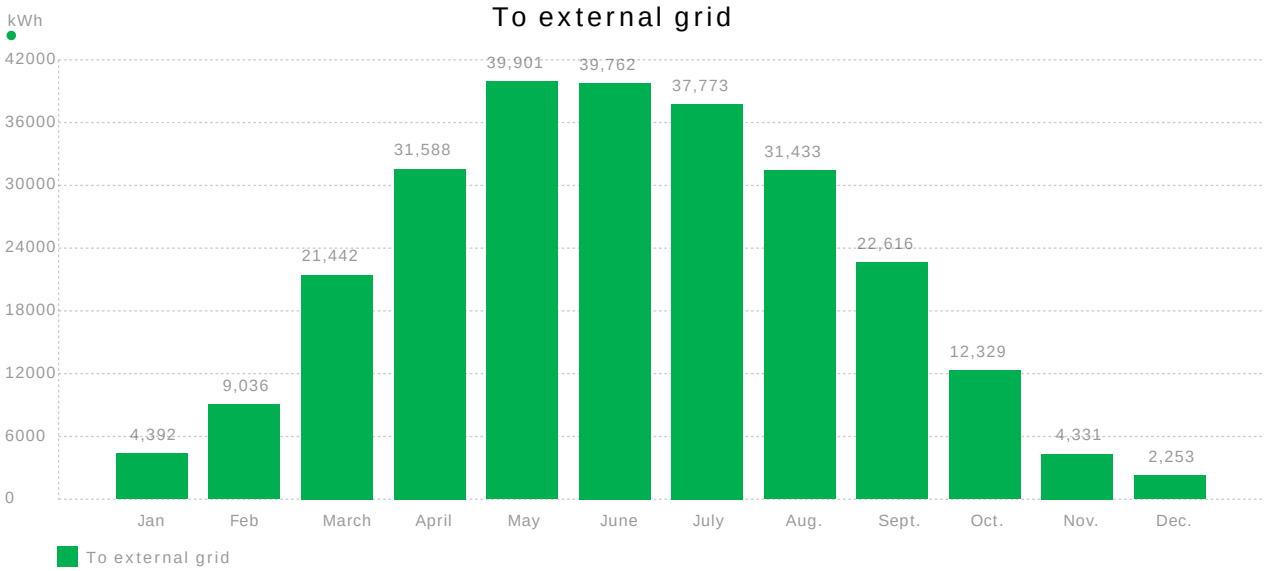

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4,392.45	9,035.85	21,442.46	31,588.44	39,900.89	39,762.43	37,772.84	31,433.04	22,616.00	12,328.71	4,330.65	2,252.59	256,856.38	To external grid

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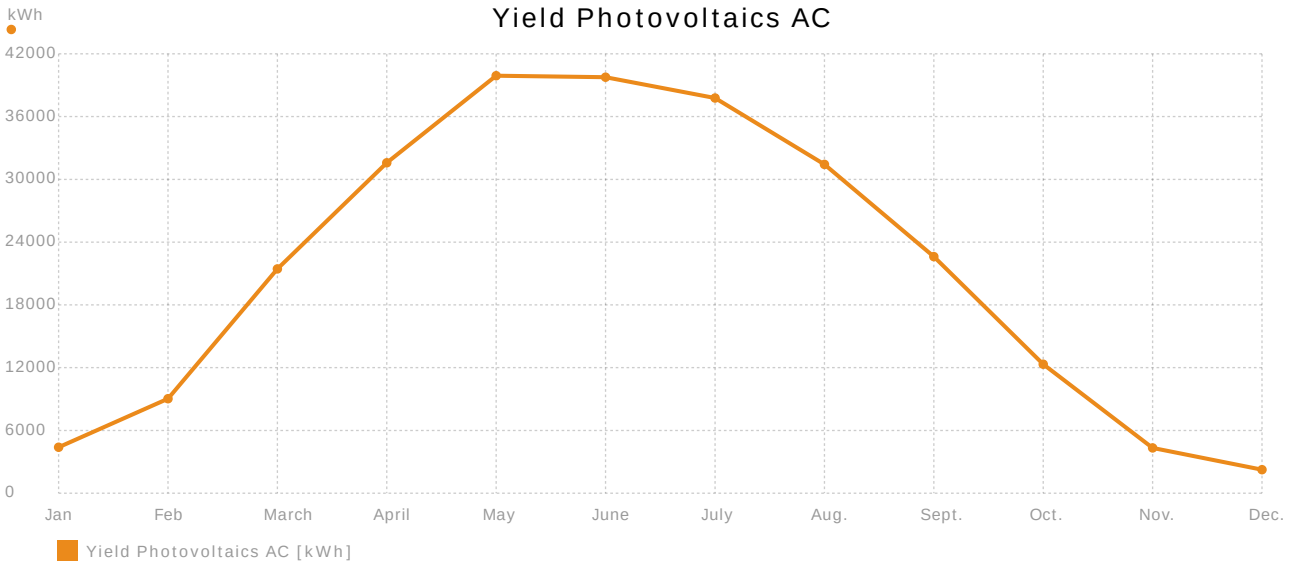

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4,392.45	9,035.85	21,442.46	31,588.44	39,900.89	39,762.43	37,772.84	31,433.04	22,616.00	12,328.71	4,330.65	2,252.59	256,856.38	Yield Photovoltaics AC [kWh]

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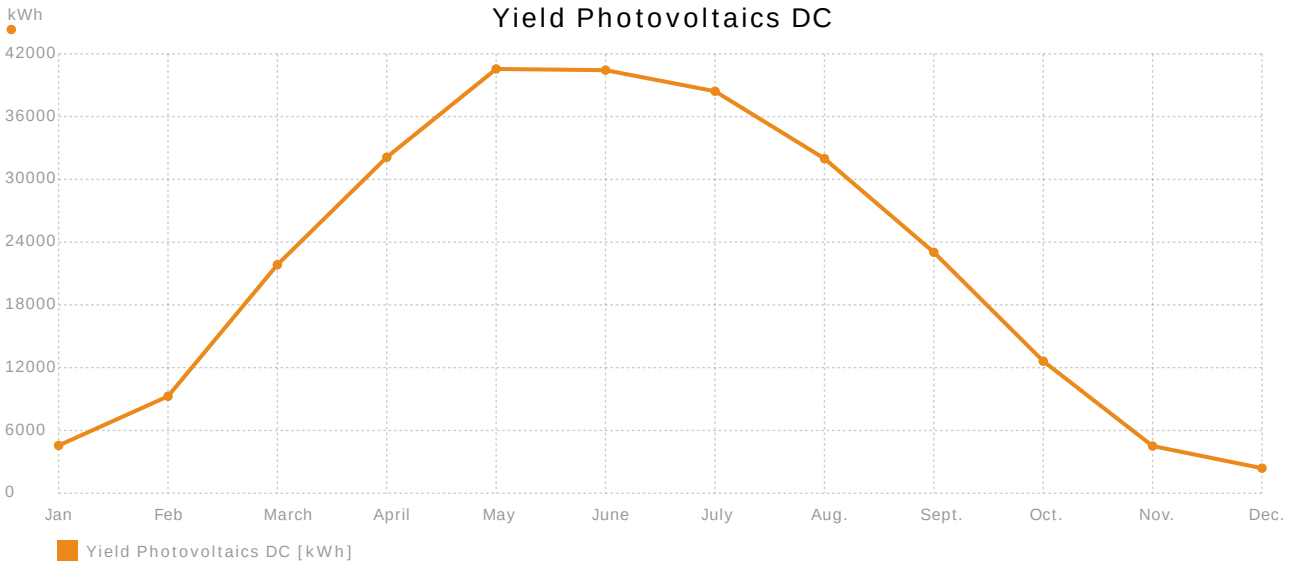

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
4,567.73	9,268.35	21,839.20	32,117.64	40,558.65	40,433.82	38,420.37	31,984.16	23,035.29	12,623.12	4,516.20	2,395.68	261,760.22	Yield Photovoltaics DC [kWh]

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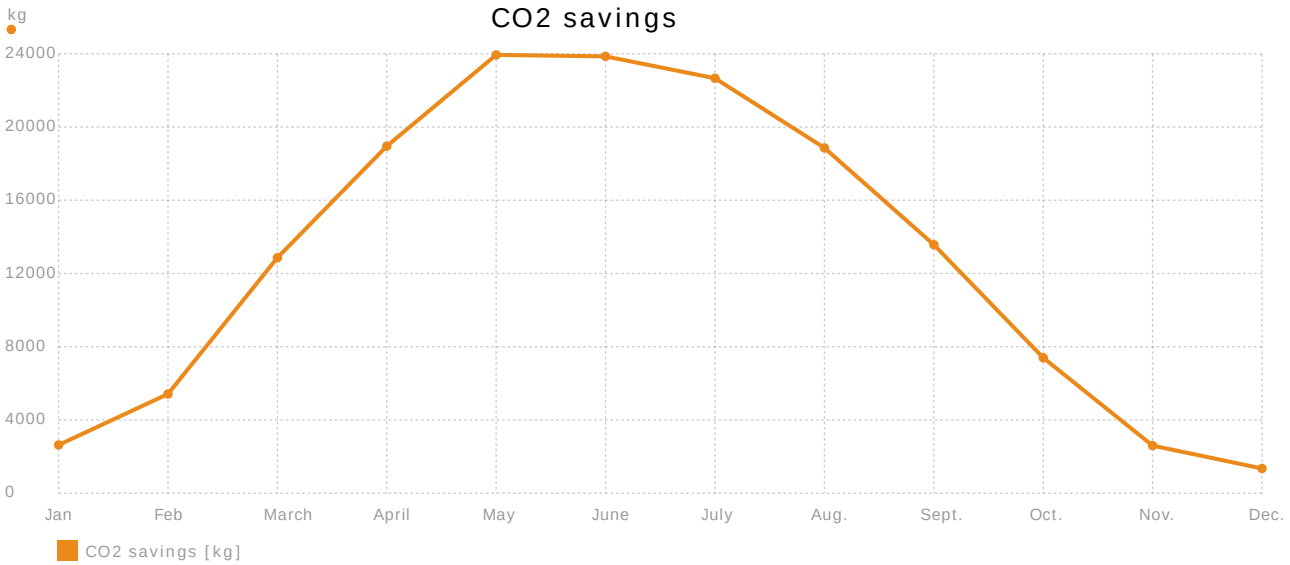

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
2,635.47	5,421.51	12,865.48	18,953.06	23,940.54	23,857.46	22,663.71	18,859.82	13,569.60	7,397.23	2,598.39	1,351.56	154,113.83	CO2 savings [kg]

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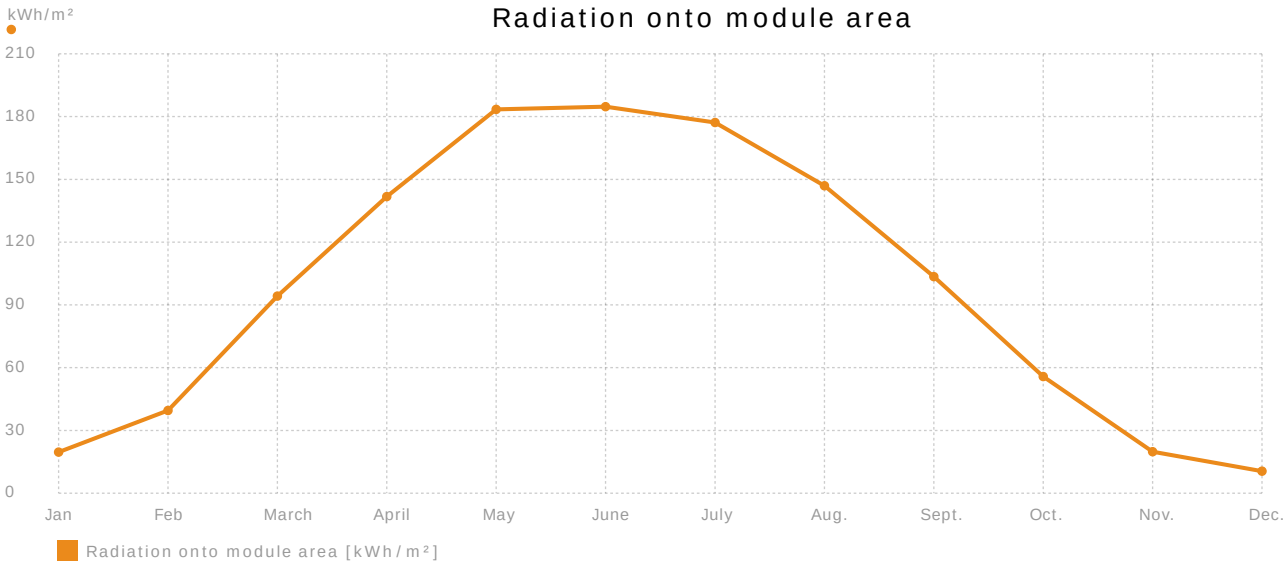

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
19.64	39.56	94.23	141.74	183.46	184.75	177.18	146.91	103.51	55.79	19.84	10.53	1,177.16	Radiation onto module area [kWh/m²]

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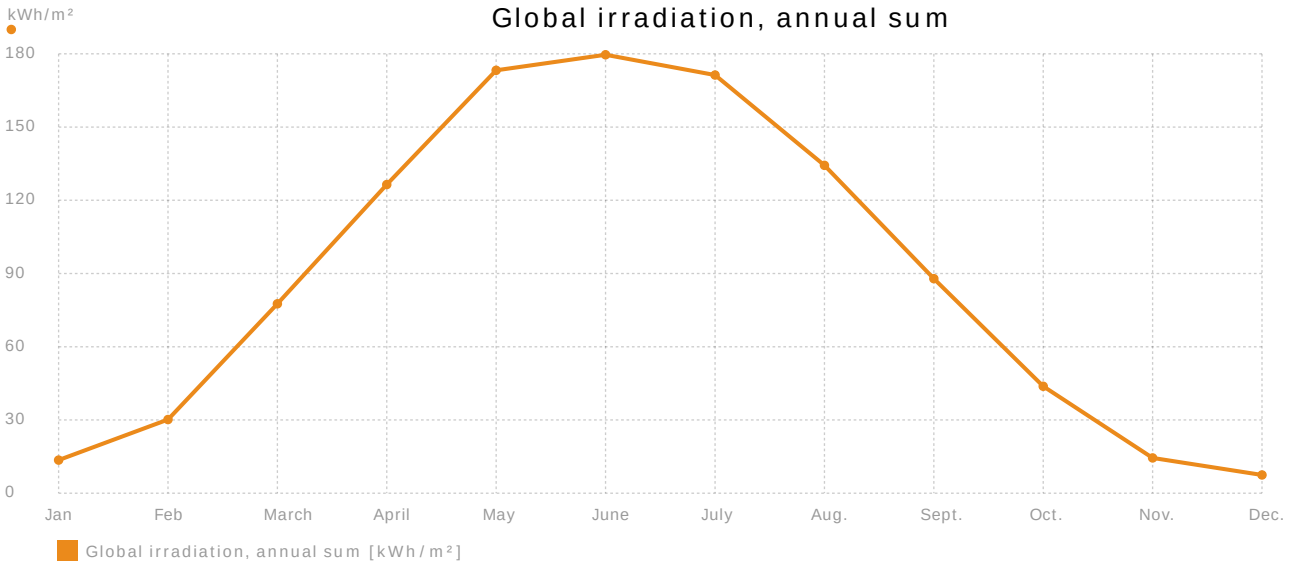

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
13.59	30.19	77.57	126.42	173.25	179.60	171.31	134.32	87.89	43.82	14.43	7.47	1,059.87	Global irradiation, annual sum [kWh/m²]

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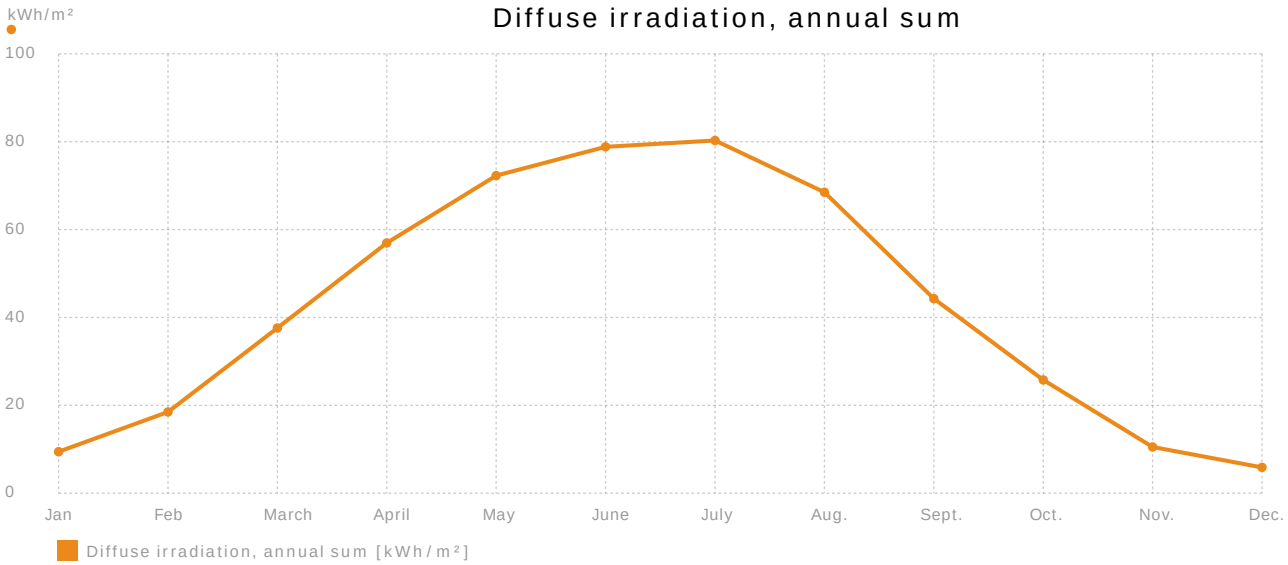

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
9.45	18.49	37.61	56.94	72.28	78.82	80.29	68.48	44.27	25.80	10.52	5.89	508.84	Diffuse irradiation, annual sum [kWh/m²]

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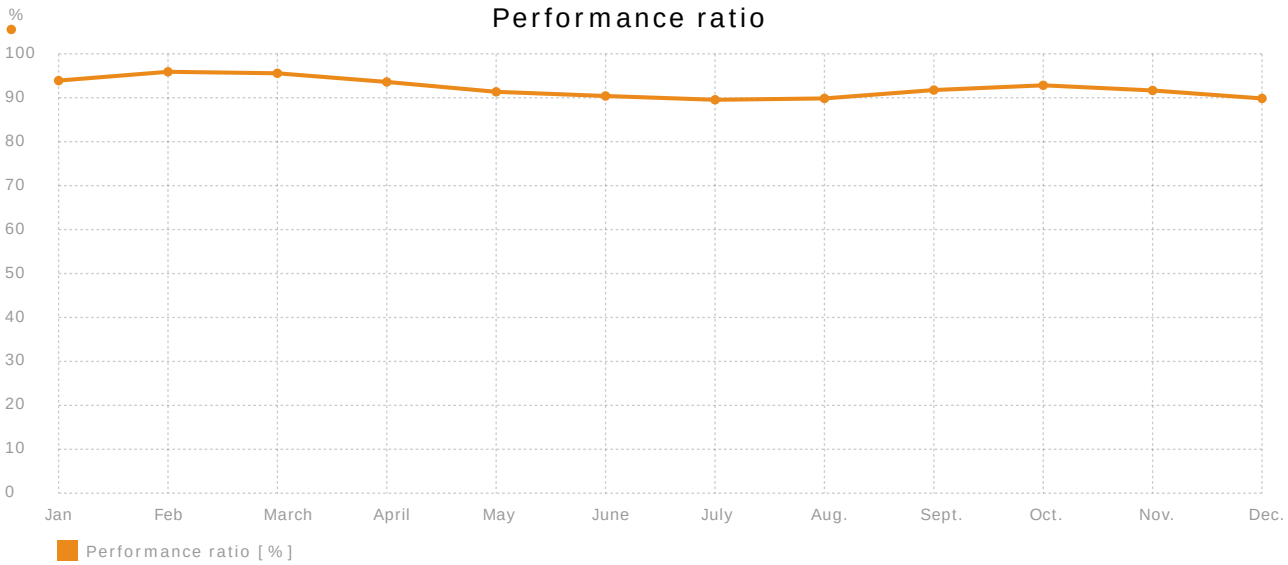

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
93.91	95.92	95.57	93.60	91.34	90.39	89.54	89.86	91.76	92.82	91.67	89.84	Performance ratio [%]

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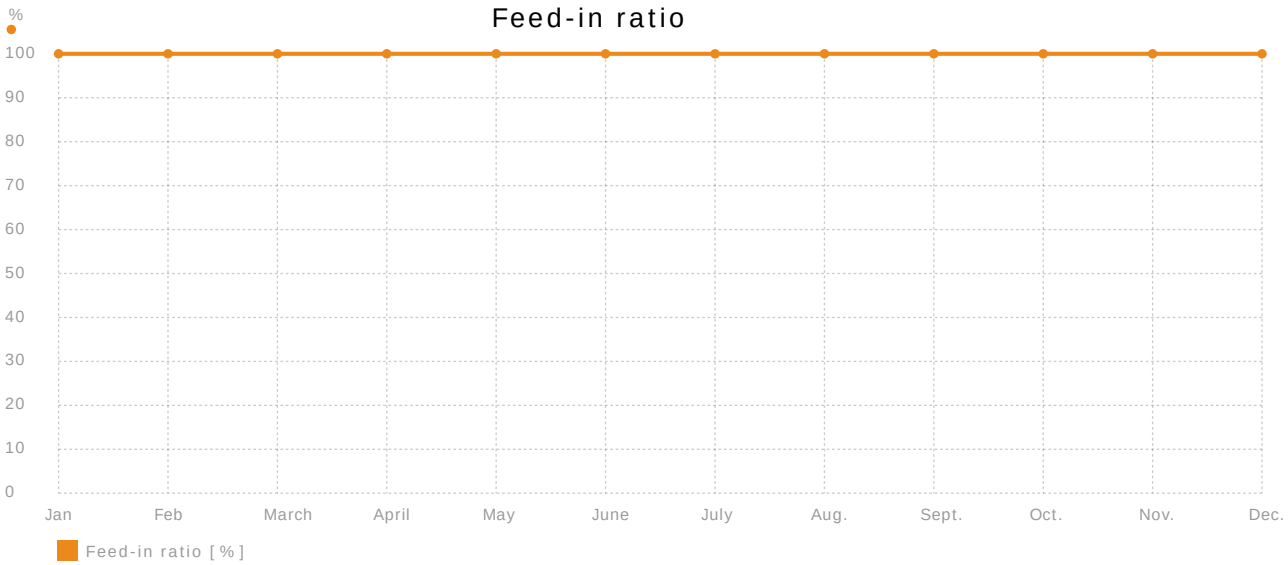

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	Feed-in ratio [%]

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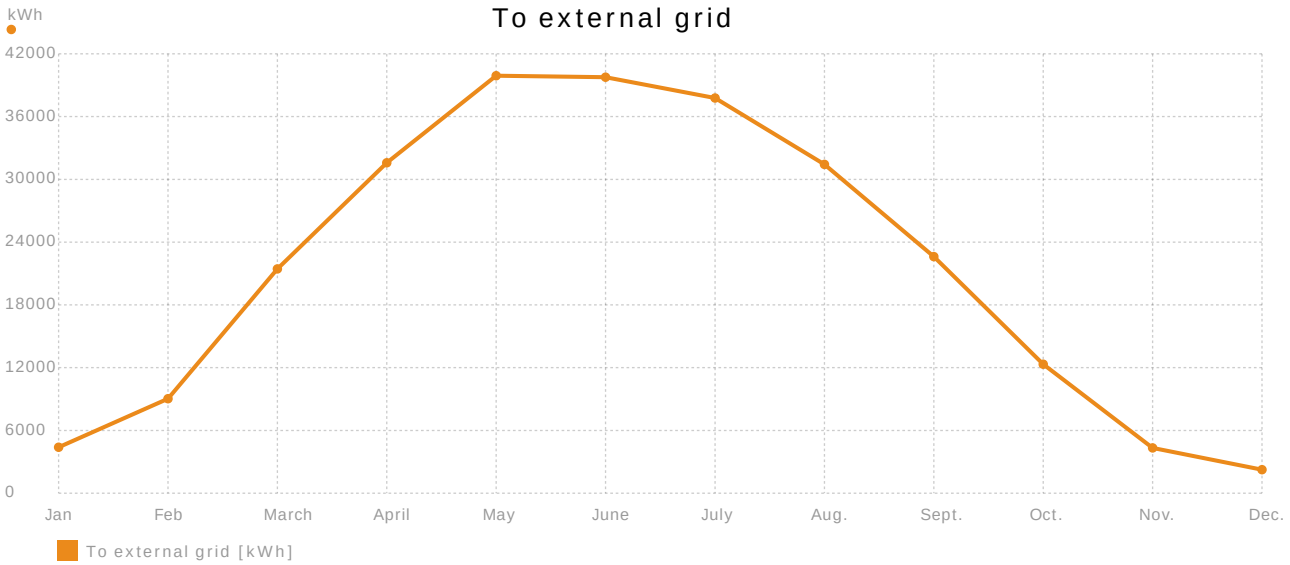

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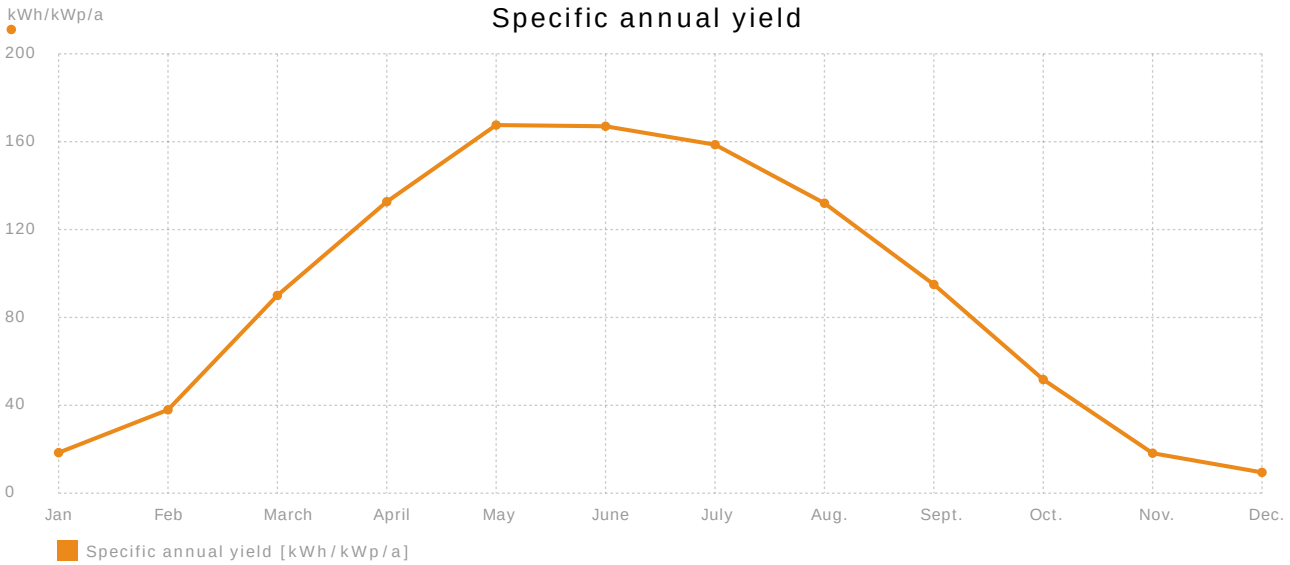

Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
18.45	37.95	90.06	132.67	167.58	167.00	158.65	132.02	94.99	51.78	18.19	9.46	1,078.80	Specific annual yield [kWh/kWp/a]

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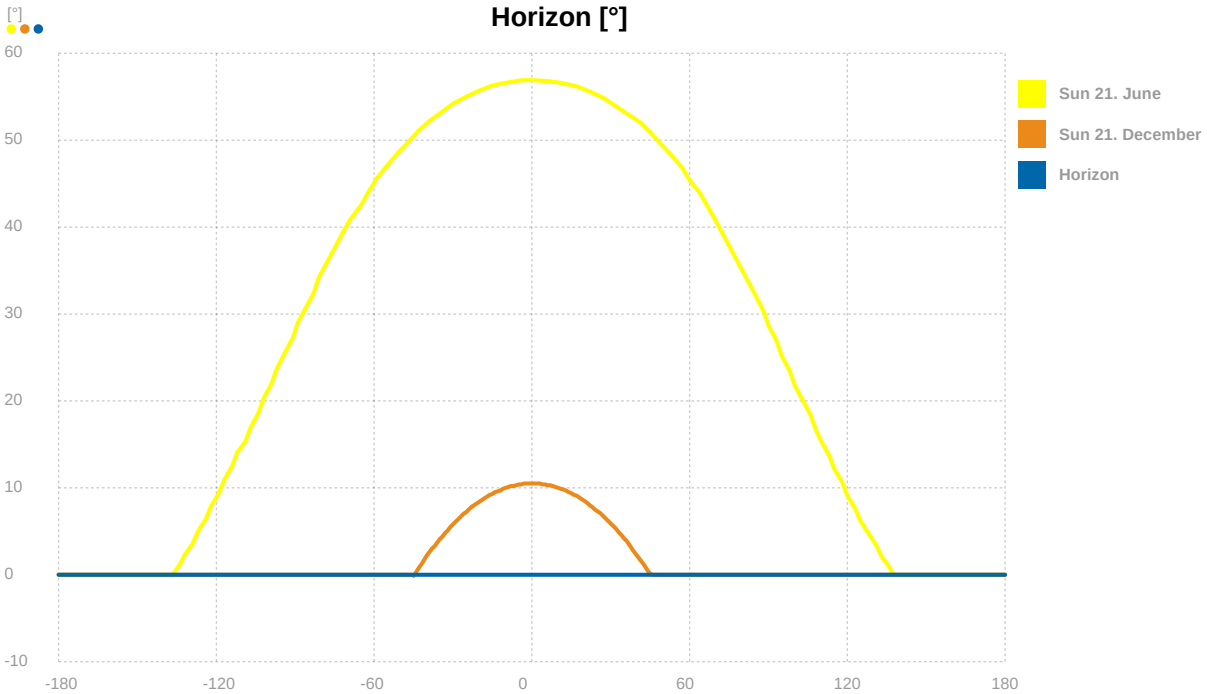

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Total yield values
(PV Planning #1)

Photovoltaic system	
PV generator power Nominal power of all modules according to STC (standard test conditions)	238.1 kW
Specific annual yield Energy production of inverters per kWp	1,079 kWh/kWp/a
Plant utilization rate (performance ratio) Relationship between the actual and theoretical possible energy yield of the system	91.6 %
PV energy yield (AC grid) Amount of energy at the grid feed-in point in the first year	256,856 kWh
PV generator area total gross area of all PV modules	1,120 m²
Avoided CO² emissions based on the CO² emissions that would normally be emitted by gray electricity production without PV energy yield	154,114 kg

Energy flow	
To external grid PV energy yield (AC grid) minus self-consumption	256,856 kWh

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