

PVsyst - Simulation report

Grid-Connected System

Project: Pavyzdinė objekto analizė_v1

Variant: Antžeminė elektrinė - 144 kW

System power: 144 kWp

LIETUVA - Lithuania

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MMSystems

**PVsyst V8.0.17**

VCO, Simulation date:
28/10/25 13:33
with V8.0.17

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Project summary**Geographical Site****LIETUVA**

Lithuania

Situation

Latitude 55.33 °(N)

Longitude 23.91 °(E)

Altitude 55 m

Time zone UTC+2

Project settings

Albedo 0.20

Weather data

LIETUVA

Meteonorm 8.1 (2007-2017), Sat=100% - Synthetic

System summary**Grid-Connected System****Orientation #1****Fixed plane**

Tilt/Azimuth 30 / 0 °

Near Shadings

Linear shadings : Fast (table)

User's needs

Probability profiles

weekly modulation

Average 2727 kWh/Day

System information**PV Array**

Nb. of modules

320 units

Pnom total

144 kWp

Inverters

Nb. of units

1 unit

Total power

100 kWac

Grid power limit

100 kWac

Grid lim. Pnom ratio

1.440

Results summary

Produced Energy 147.18 MWh/year

Specific production 1022 kWh/kWp/year

Perf. Ratio PR 83.73 %

Used Energy 1400.89 MWh/year

Solar Fraction SF 8.93 %

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General parameters**Grid-Connected System****Orientation #1****Fixed plane**

Tilt/Azimuth 30 / 0 °

Sheds configuration

Nb. of sheds 16 units

Set of tables

Shading limit angle

Limit profile angle 19.9 °

Sizes

Sheds spacing 8.00 m

Sensitive width 3.54 m

GCR Shading 44.5 %

Top inactive band 0.02 m

Bottom inactive band 0.02 m

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Free Horizon

Near Shadings

Linear shadings : Fast (table)

User's needs

Probability profiles

weekly modulation

Average 2727 kWh/Day

Grid power limitation

Active power 100 kWac

Pnom ratio 1.440

Limit applied at the injection point

PV Array Characteristics**PV module**

Manufacturer Heckert Solar

Model ZEUS 1.0 108M - 450Wp

(Custom parameters definition)

Heckert Solar_ZEUS 1.0 108M - 450Wp.PAN

Unit Nom. Power 450 Wp

Number of PV modules 320 units

Nominal (STC) 144 kWp

Modules 16 string x 20 In series

At operating cond. (50°C)

Pmpp 135 kWp

U mpp 624 V

I mpp 217 A

Total PV power

Nominal (STC) 144 kWp

Total 320 modules

Module area 639 m²

Cell area 572 m²

Inverter

Manufacturer

Kaco new energy

Model

Blueplanet-100-NX3-M8

(Original PVsyst database)

Unit Nom. Power 100 kWac

Number of inverters 8 * MPPT 13% 1 unit

Total power 100 kWac

Operating voltage 550-850 V

Pnom ratio (DC:AC) 1.44

No power sharing between MPPTs

Total inverter power

Total power 100 kWac

Number of inverters 1 unit

Pnom ratio 1.44

Array losses**Thermal Loss factor**

Module temperature according to irradiance

Uc (const) 20.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 47 mΩ

Loss Fraction 1.50 % at STC

Module Quality Loss

Loss Fraction 3.00 %

Module mismatch losses

Loss Fraction 2.00 % at MPP

Strings Mismatch loss

Loss Fraction 0.05 %

IAM loss factor

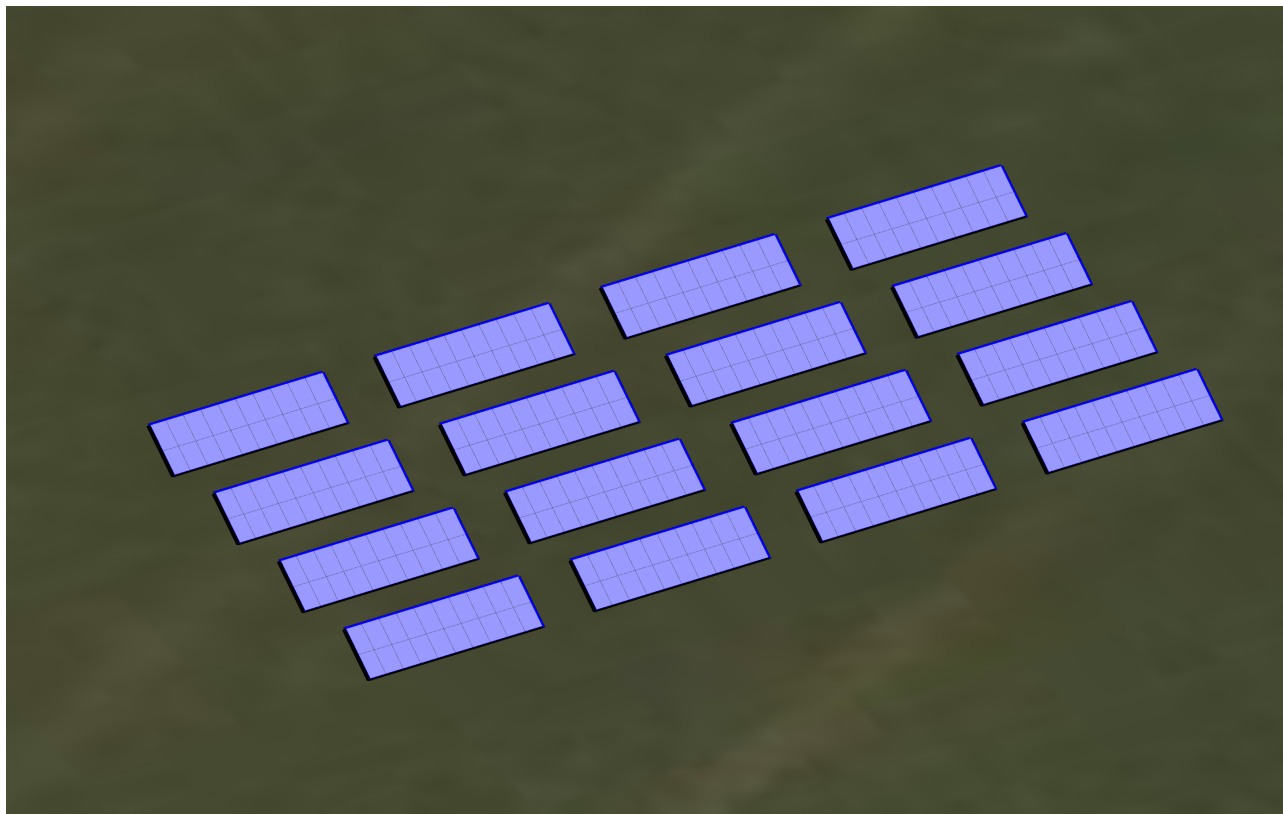
Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.963	0.892	0.814	0.679	0.438	0.000



Near shadings parameter

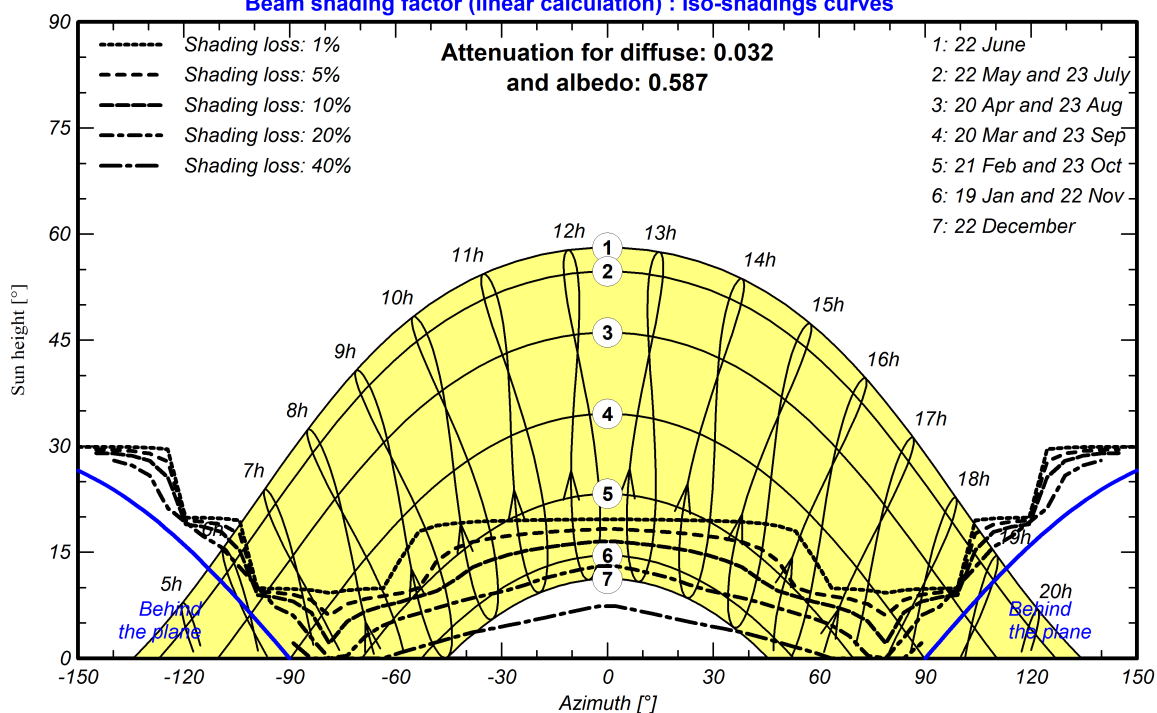
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1 - Fixed plane, Tilts/azimuths: 30°/ 0°

Beam shading factor (linear calculation) : Iso-shadings curves





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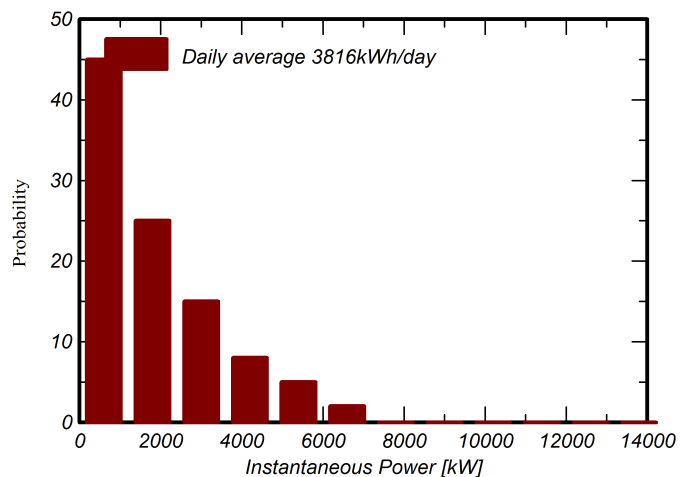
Detailed User's needs

Probability profiles, weekly modulation, average = 2727 kWh/day

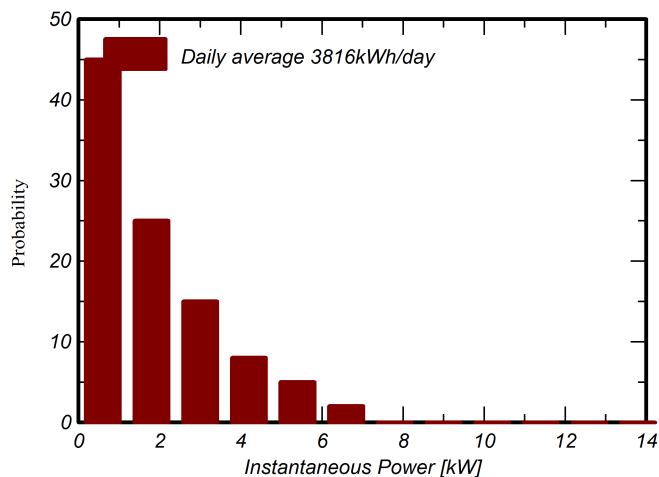
Class	0... 100	100... 200	200... 300	300... 400	400... 500	500... 600	600... 700	700... 800	800... 900	900... 1000	1000... 1100	1100... 1200	kW
Working Days	45.0	25.0	15.0	8.0	5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	%/class

Class	0... 0	0... 0	0... 0	0... 0	0... 1	1... 1	1... 1	1... 1	1... 1	1... 1	1... 1	1... 1	kW
1	45.0	25.0	15.0	8.0	5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	%/class

Working Days



Week-Ends (2 day)





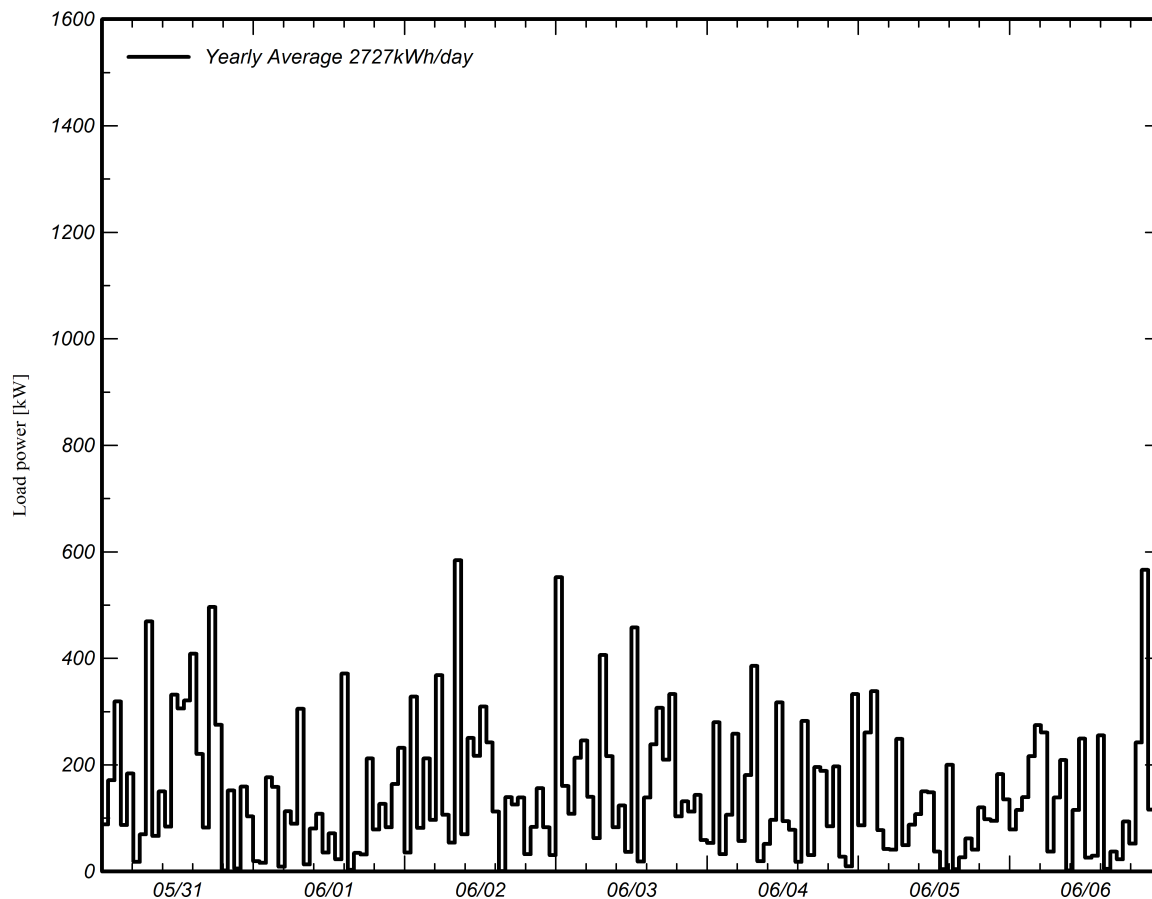
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Detailed User's needs

Sample : Probability profiles, weekly modulation





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Main results

System Production

Produced Energy 147.18 MWh/year
Used Energy 1400.89 MWh/year

Specific production 1022 kWh/kWp/year
Perf. Ratio PR 83.73 %
Solar Fraction SF 8.93 %

Economic evaluation

Investment

Global 70000.00 EUR
Specific 0.49 EUR/Wp

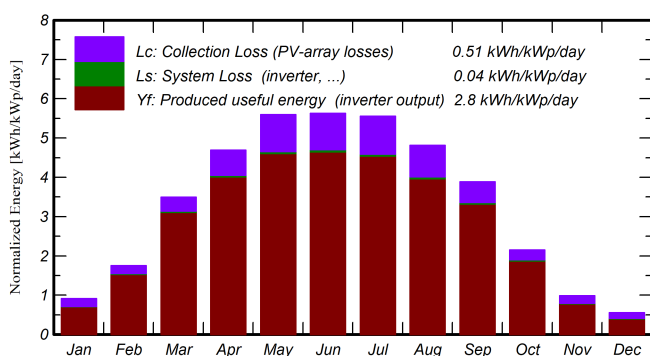
Yearly cost

Annuities 0.00 EUR/yr
Run. costs 1352.27 EUR/yr
Payback period 3.2 years

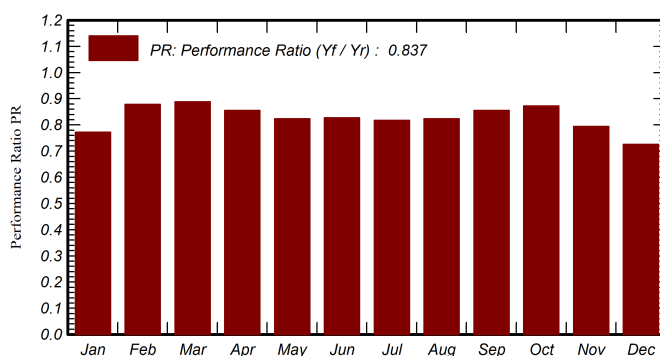
LCOE

Energy cost 0.03 EUR/kWh

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_User	E_Solar	E_Grid	EFrGrid
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	MWh	MWh	MWh	MWh	MWh
January	15.6	11.33	-3.78	28.4	23.4	3.2	127.4	2.96	0.20	124.5
February	30.8	19.76	-2.90	49.0	45.5	6.3	107.2	5.80	0.40	101.4
March	78.7	41.64	1.40	108.4	104.3	14.0	116.1	12.10	1.78	104.0
April	116.5	55.60	7.81	140.7	135.3	17.5	119.6	14.31	3.03	105.3
May	163.7	73.75	13.82	173.5	166.2	20.8	118.6	17.12	3.46	101.5
June	166.3	80.62	16.52	168.9	161.7	20.4	116.2	17.06	3.05	99.2
July	165.8	80.59	19.56	172.3	165.0	20.5	114.8	16.86	3.42	98.0
August	134.1	65.42	18.36	149.4	143.1	17.9	115.8	14.94	2.79	100.8
September	87.8	43.06	12.91	116.7	112.2	14.5	117.5	11.77	2.59	105.7
October	46.0	29.41	7.31	66.7	63.4	8.5	116.9	7.30	1.08	109.6
November	17.3	11.96	3.16	29.5	25.6	3.4	120.0	3.15	0.23	116.8
December	9.7	7.50	-0.59	17.2	13.7	1.9	110.6	1.77	0.03	108.8
Year	1032.3	520.64	7.86	1220.7	1159.6	149.1	1400.9	125.14	22.04	1275.7

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_User	Energy supplied to the user
T_Amb	Ambient Temperature	E_Solar	Energy from the sun
GlobInc	Global incident in coll. plane	E_Grid	Energy injected into grid
GlobEff	Effective Global, corr. for IAM and shadings	EFrGrid	Energy from the grid

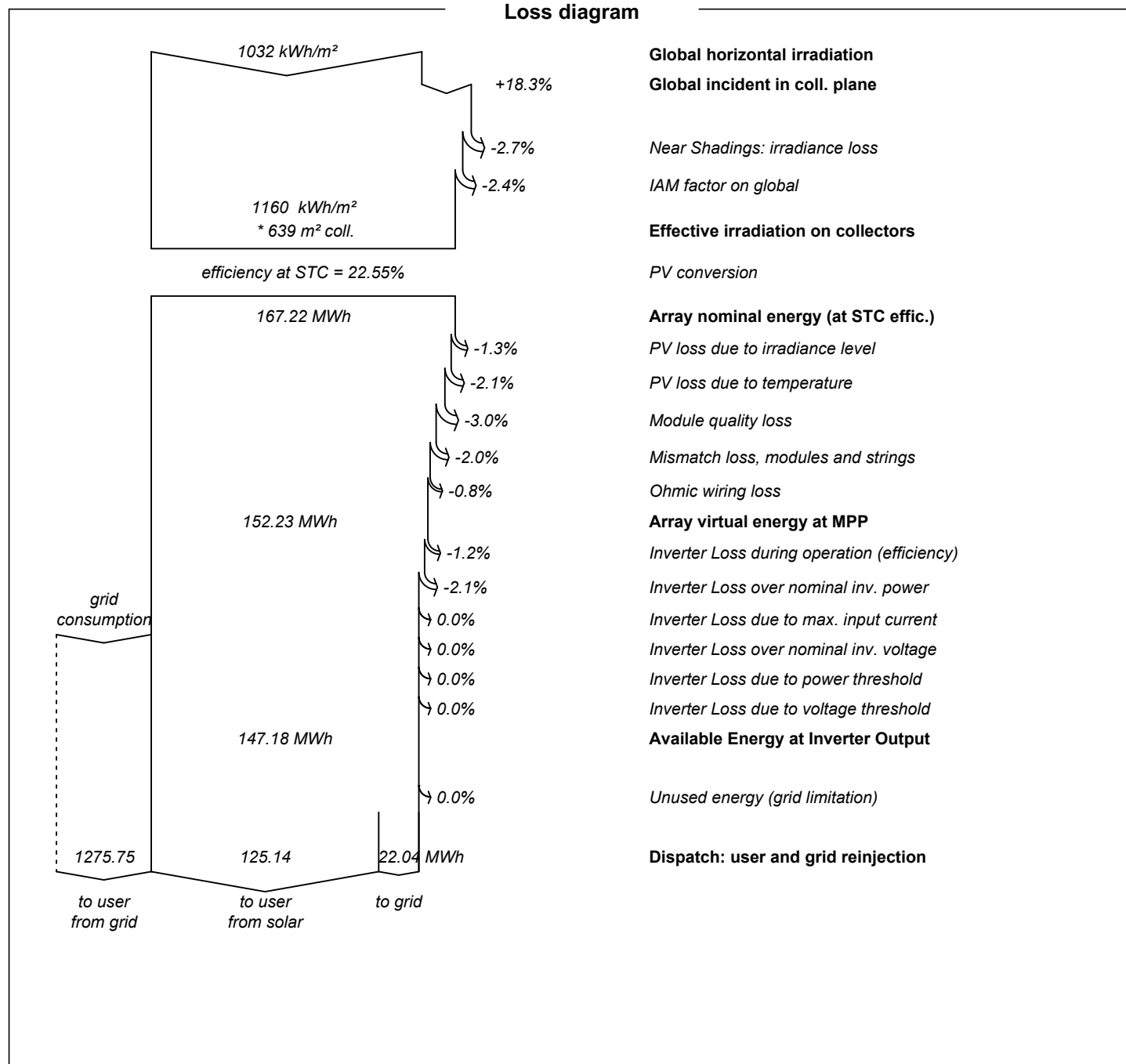


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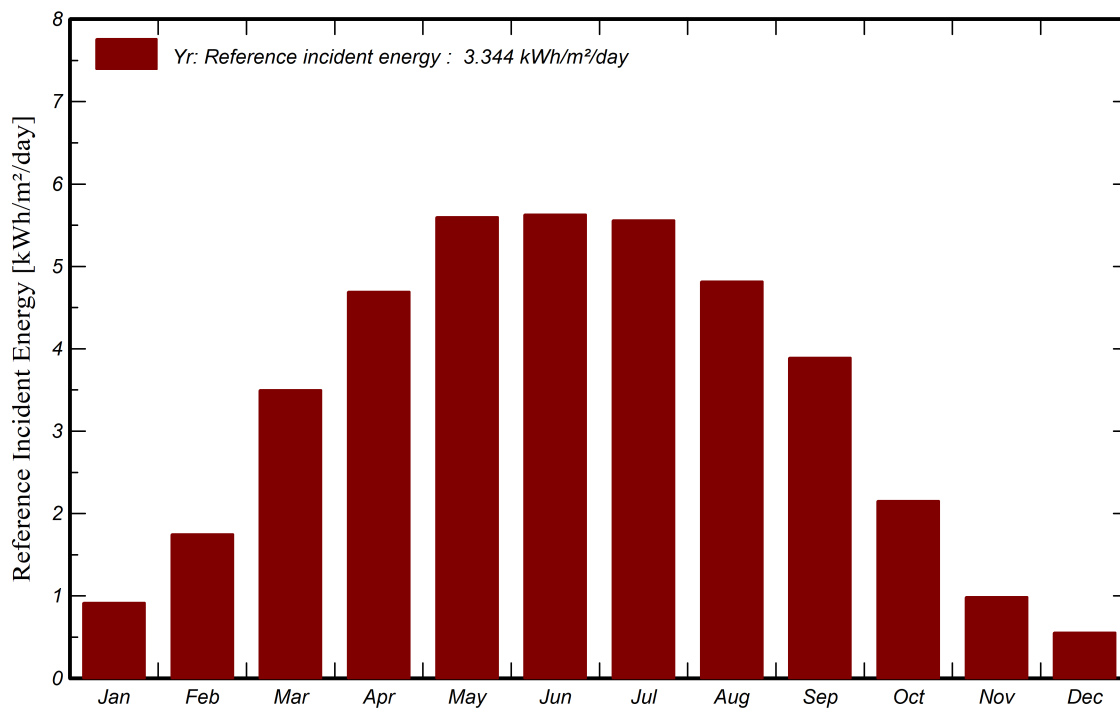
Loss diagram



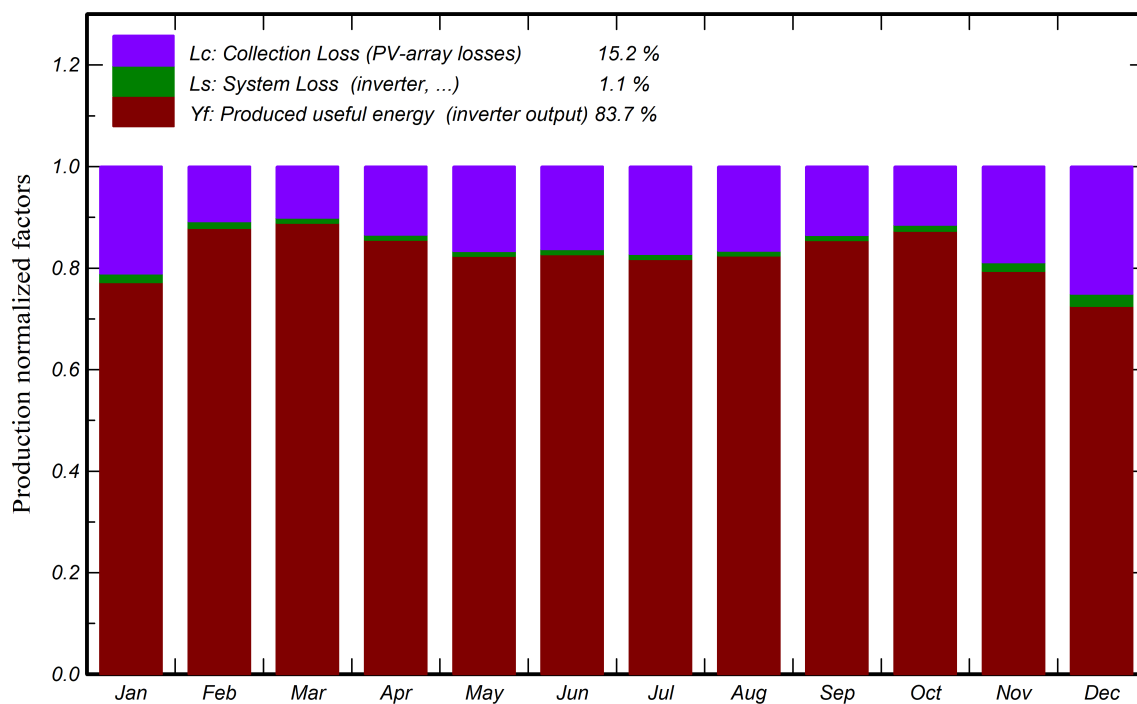


Predef. graphs

Reference Incident Energy in Collector Plane



Normalized Production and Loss Factors





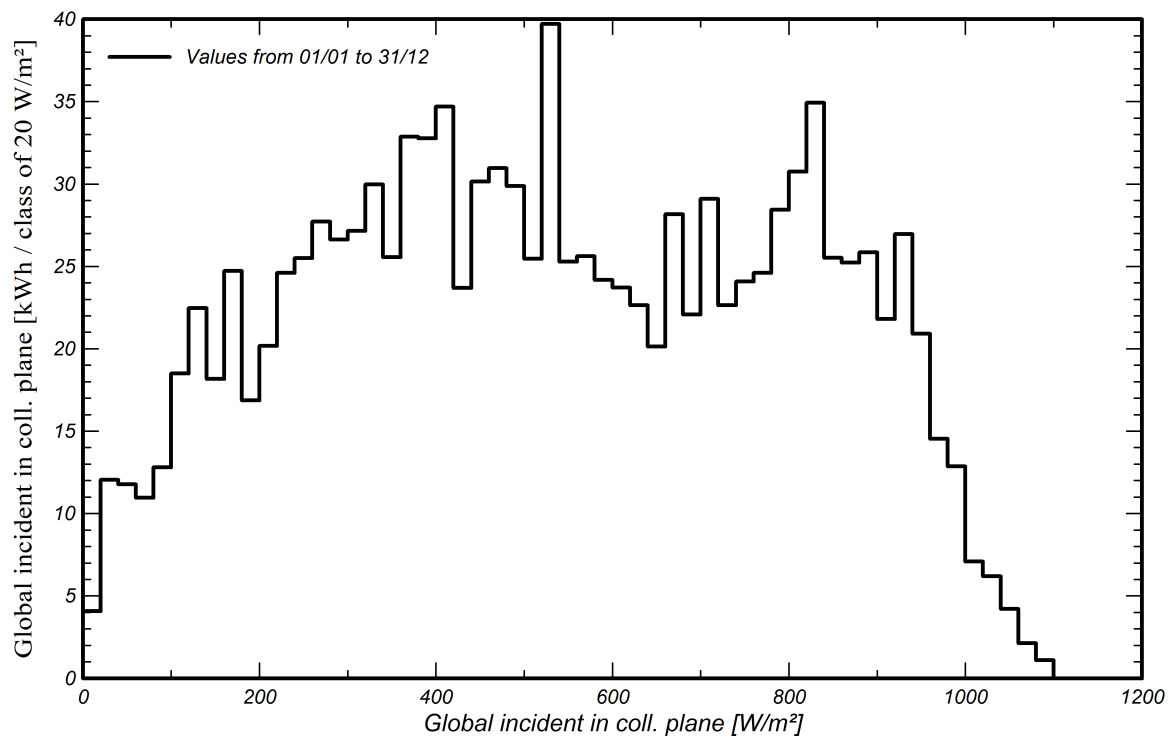
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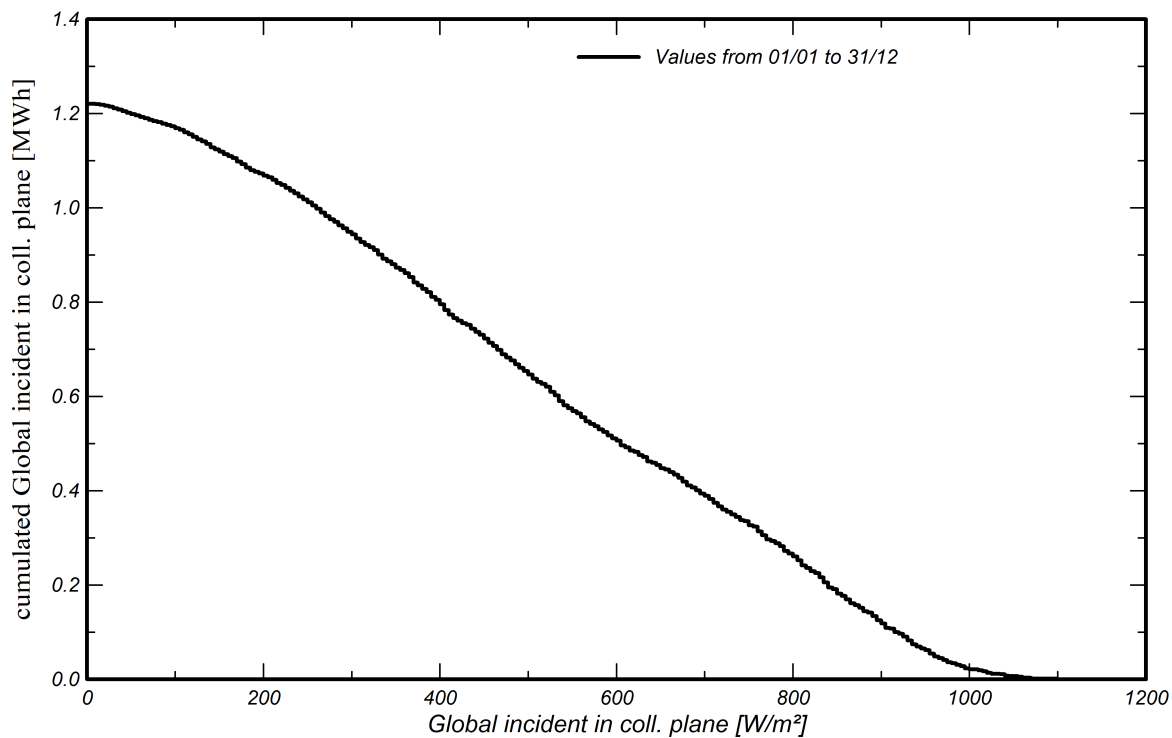
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Predef. graphs

Incident Irradiation Distribution



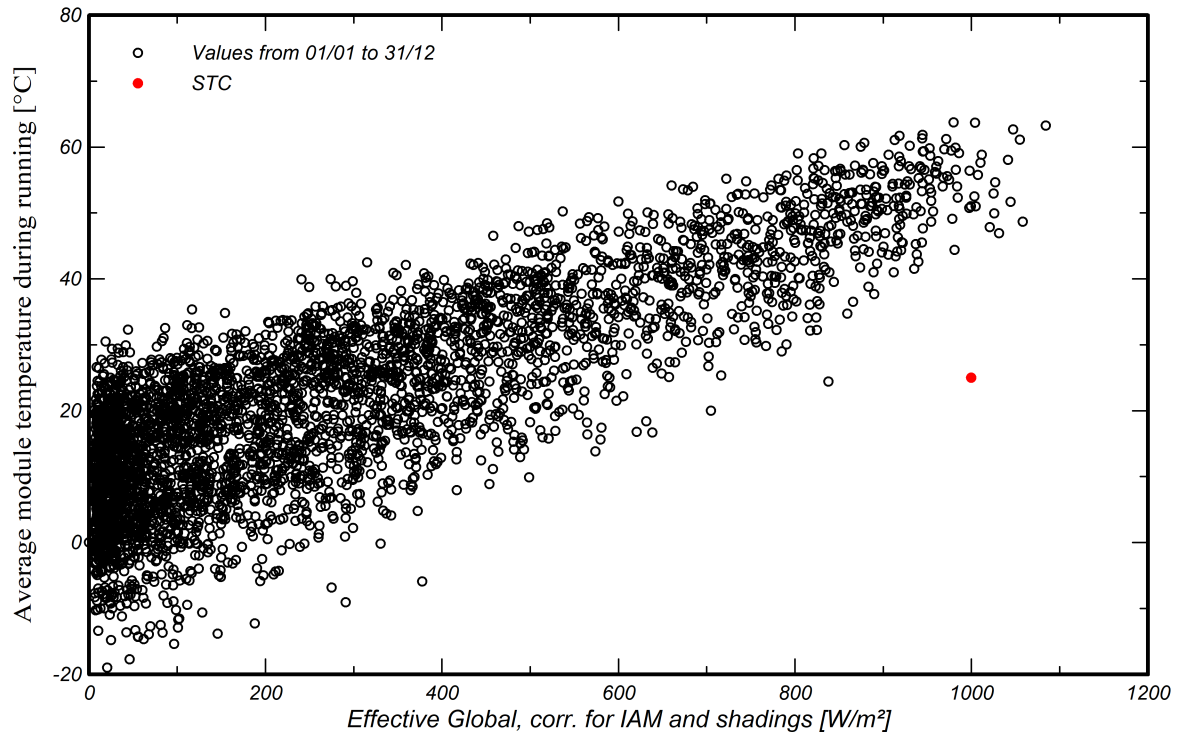
Incident Irradiation cumulative distribution



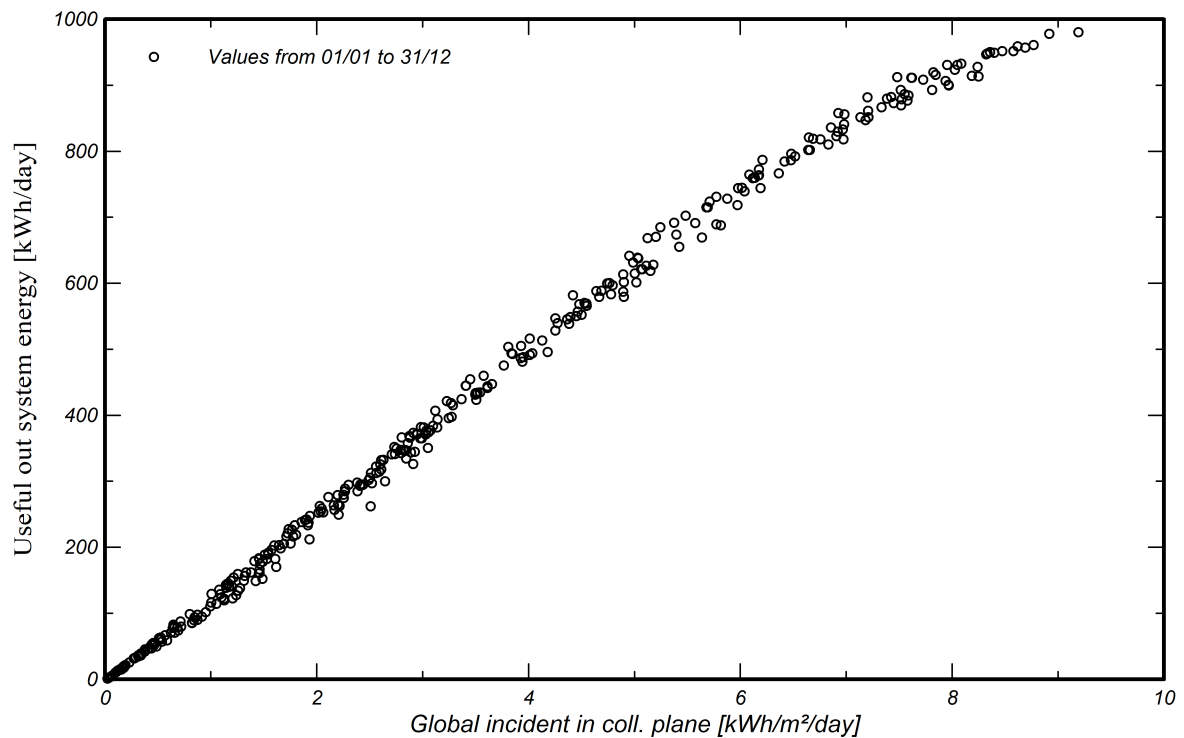


Predef. graphs

Array Temperature vs. Effective Irradiance



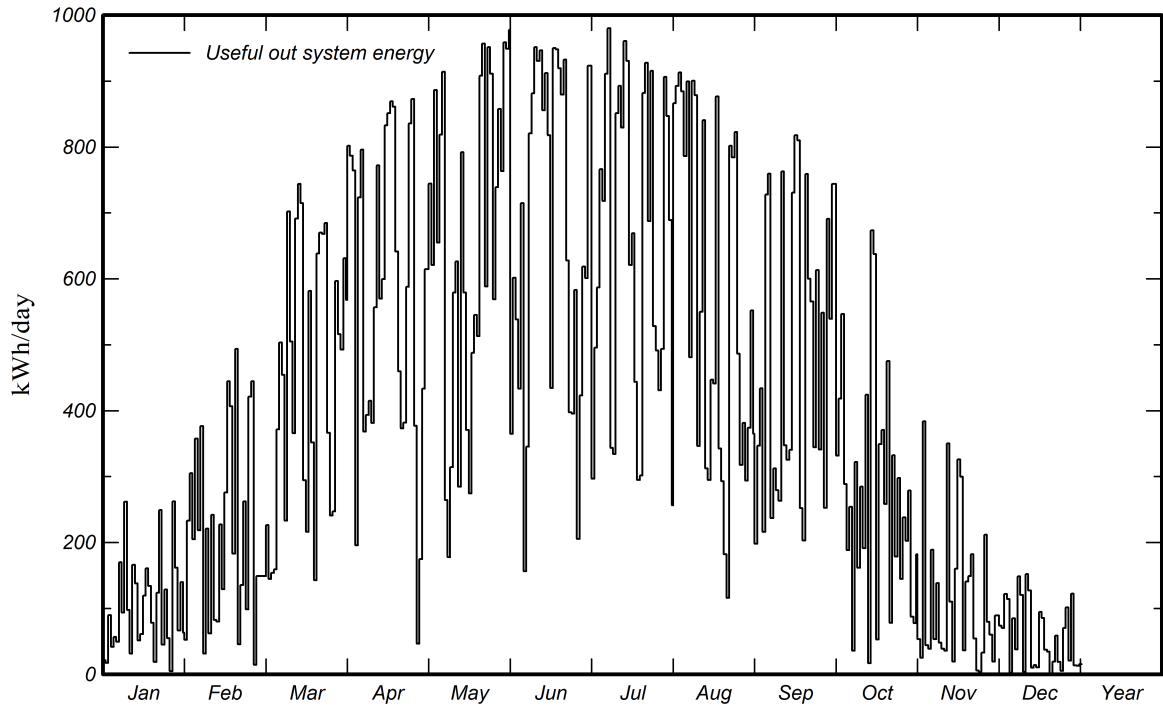
Daily Input/Output diagram



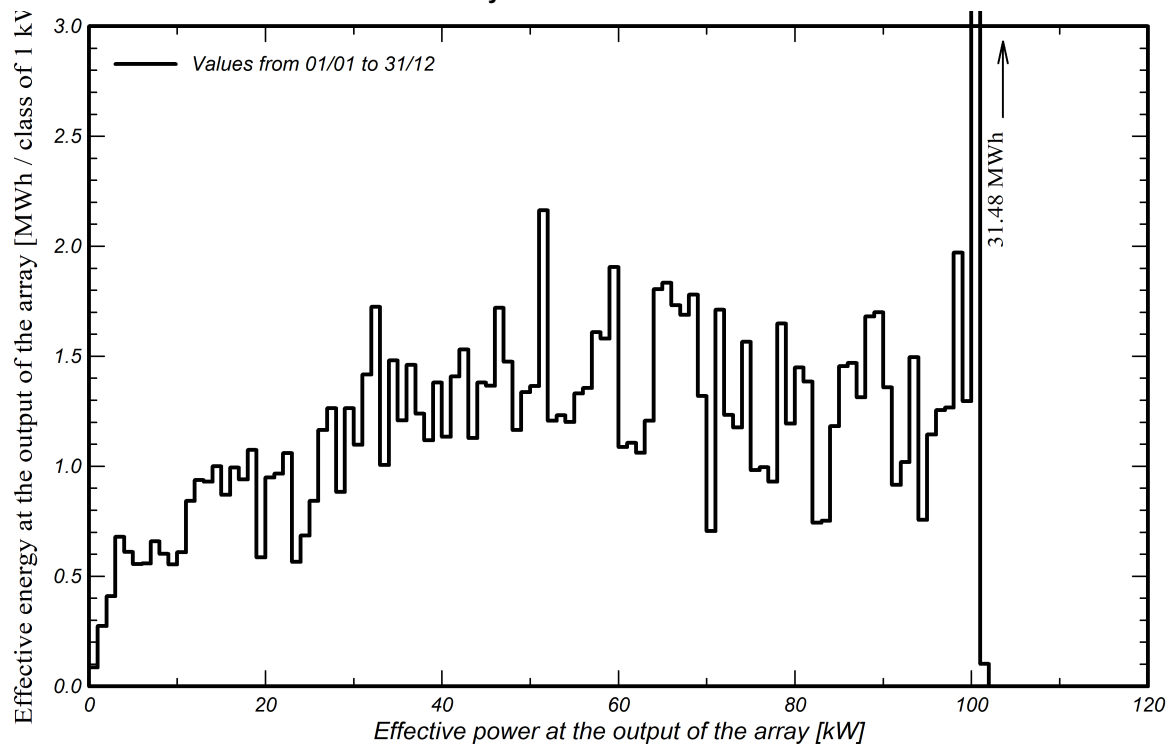


Predef. graphs

Daily System Output Energy



Array Power Distribution





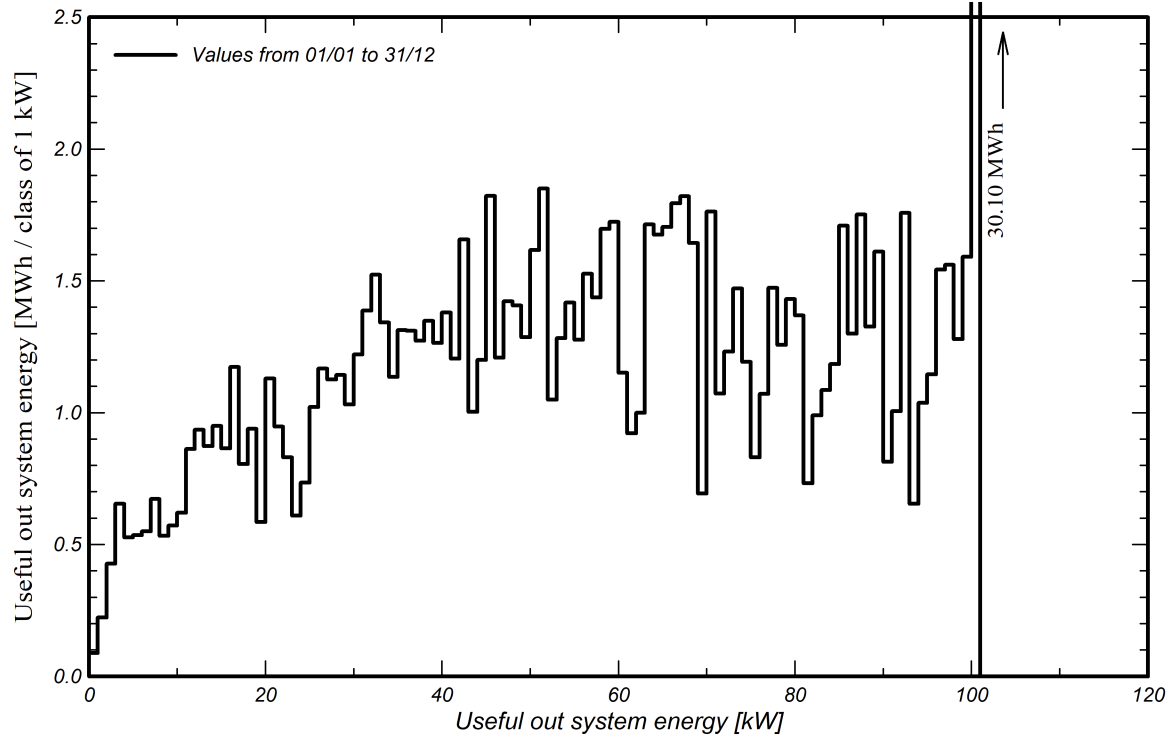
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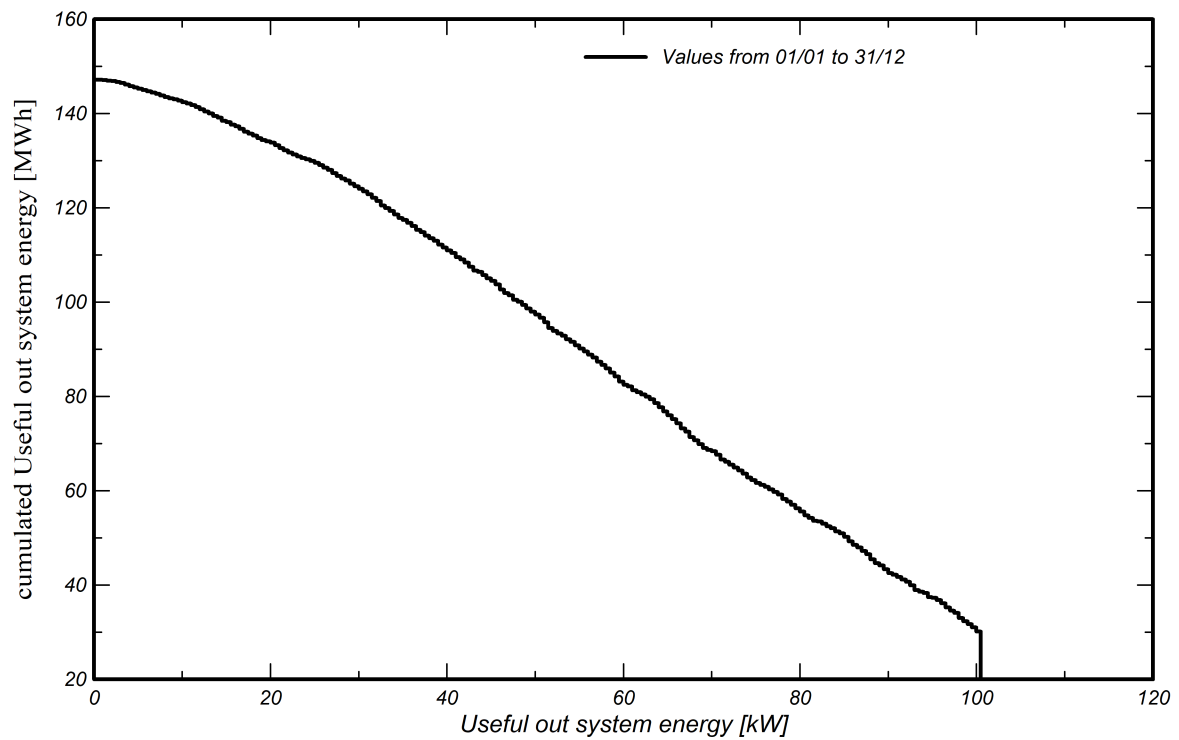
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Predef. graphs

System Output Power Distribution



System Output Power cumulative distribution





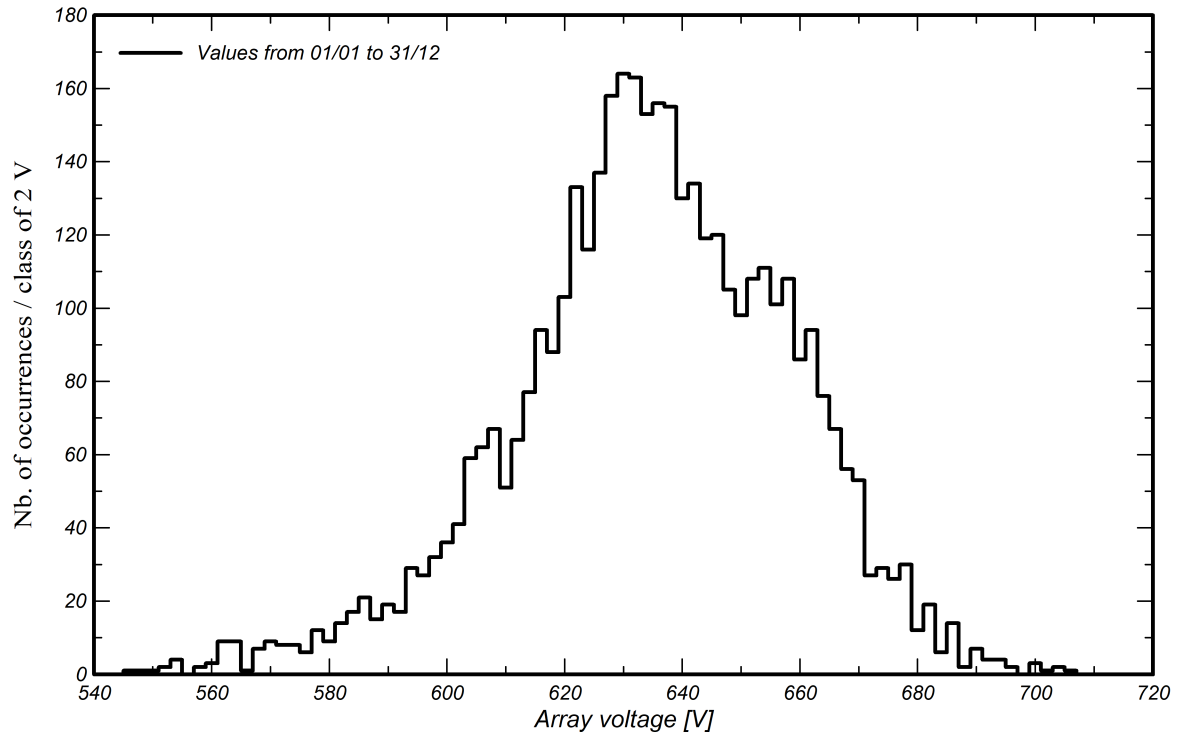
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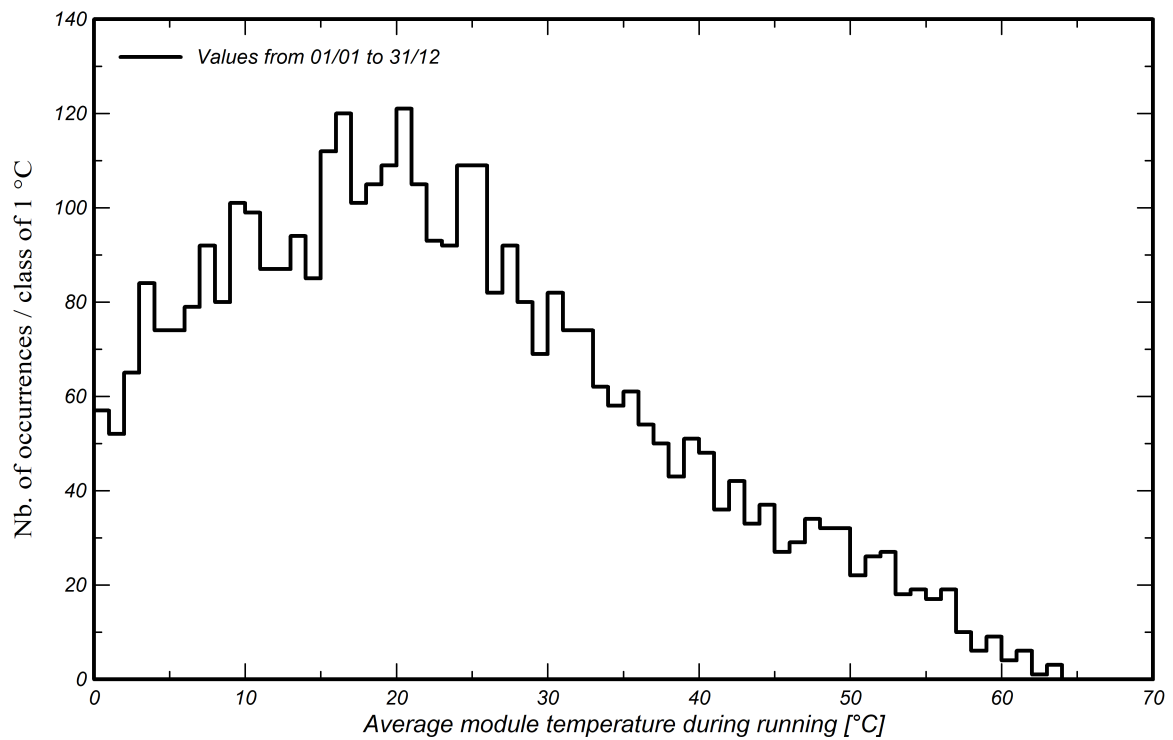
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Predef. graphs

Array Voltage Distribution



Array Temperature Distribution during running





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Ageing Tool

Ageing Parameters

Time span of simulation 30 years

Module average degradation

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year

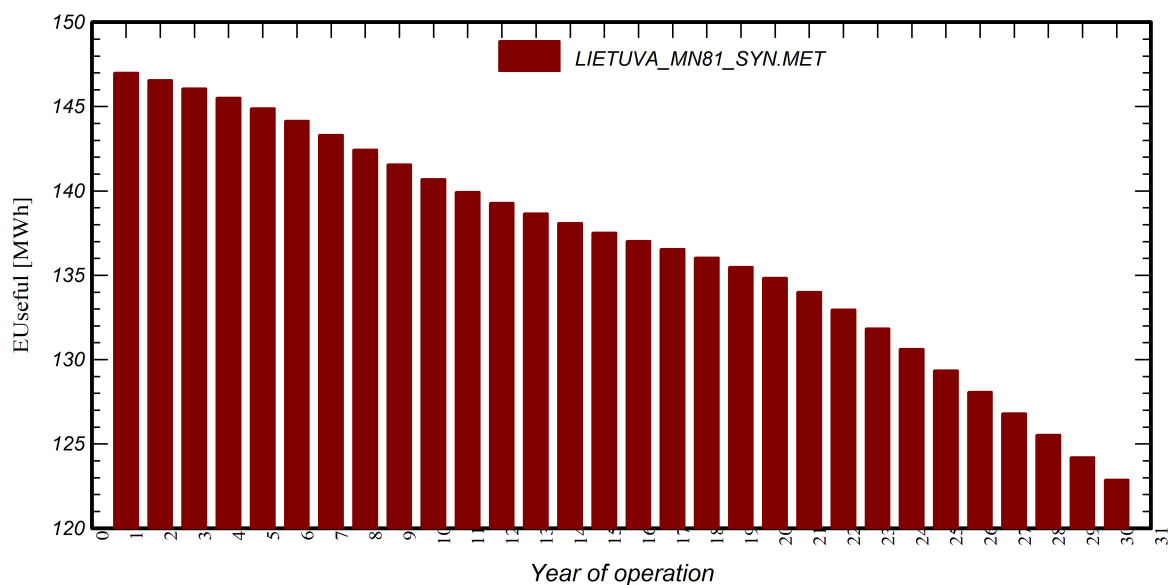
Vmp RMS dispersion 0.4 %/year

Weather data used in the simulation

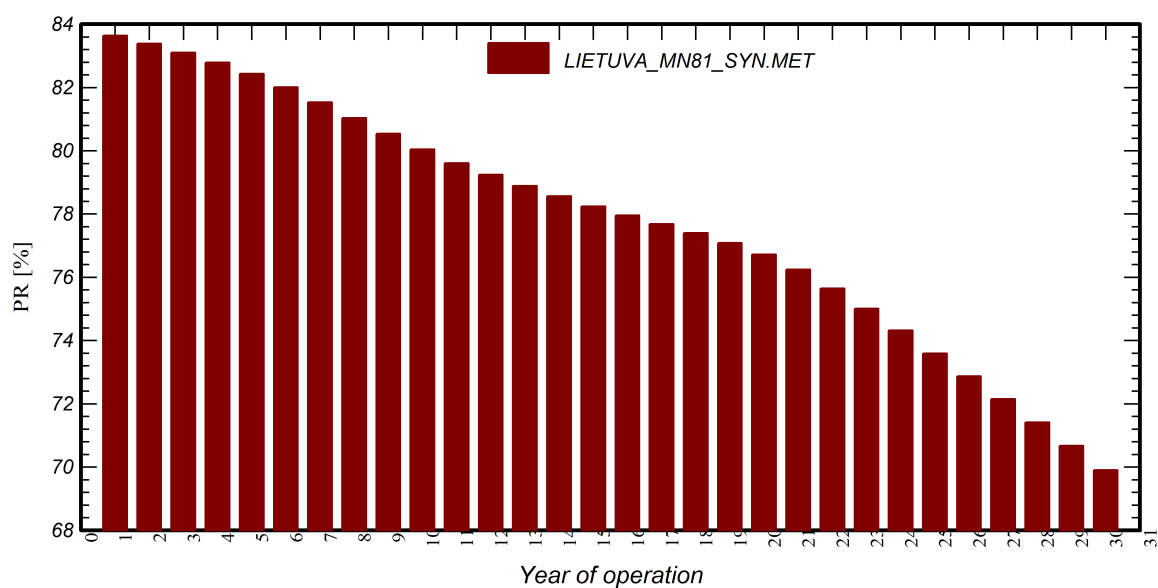
LIETUVA MN81 SYN

Years reference year

Useful out system energy



Performance Ratio



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Ageing Tool**Ageing Parameters**

Time span of simulation 30 years

Module average degradation

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year

Vmp RMS dispersion 0.4 %/year

Weather data used in the simulation**LIETUVA MN81 SYN**

Years reference year

	EUseful	PR	PR loss
Year	MWh	%	%
1	147.01	83.63	-0.15
2	146.57	83.39	-0.44
3	146.08	83.10	-0.78
4	145.52	82.78	-1.16
5	144.89	82.43	-1.59
6	144.15	82.01	-2.09
7	143.31	81.53	-2.66
8	142.44	81.04	-3.25
9	141.56	80.53	-3.85
10	140.69	80.04	-4.44
11	139.93	79.61	-4.96
12	139.28	79.24	-5.40
13	138.67	78.89	-5.81
14	138.09	78.56	-6.21
15	137.53	78.24	-6.59
16	137.02	77.95	-6.93
17	136.55	77.68	-7.25
18	136.05	77.40	-7.59
19	135.49	77.08	-7.97
20	134.85	76.72	-8.40
21	134.02	76.24	-8.97
22	132.97	75.65	-9.68
23	131.84	75.00	-10.45
24	130.63	74.31	-11.28
25	129.35	73.59	-12.14
26	128.08	72.86	-13.01
27	126.82	72.15	-13.86
28	125.53	71.41	-14.74
29	124.21	70.67	-15.63
30	122.87	69.90	-16.54



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P50 - P90 evaluation

Weather data

Source Meteoronorm 8.1 (2007-2017), Sat=100%
Kind Not defined
Year-to-year variability(Variance) 0.0 %

Specified Deviation

Global variability (weather data + system)

Variability (Quadratic sum) 1.8 %

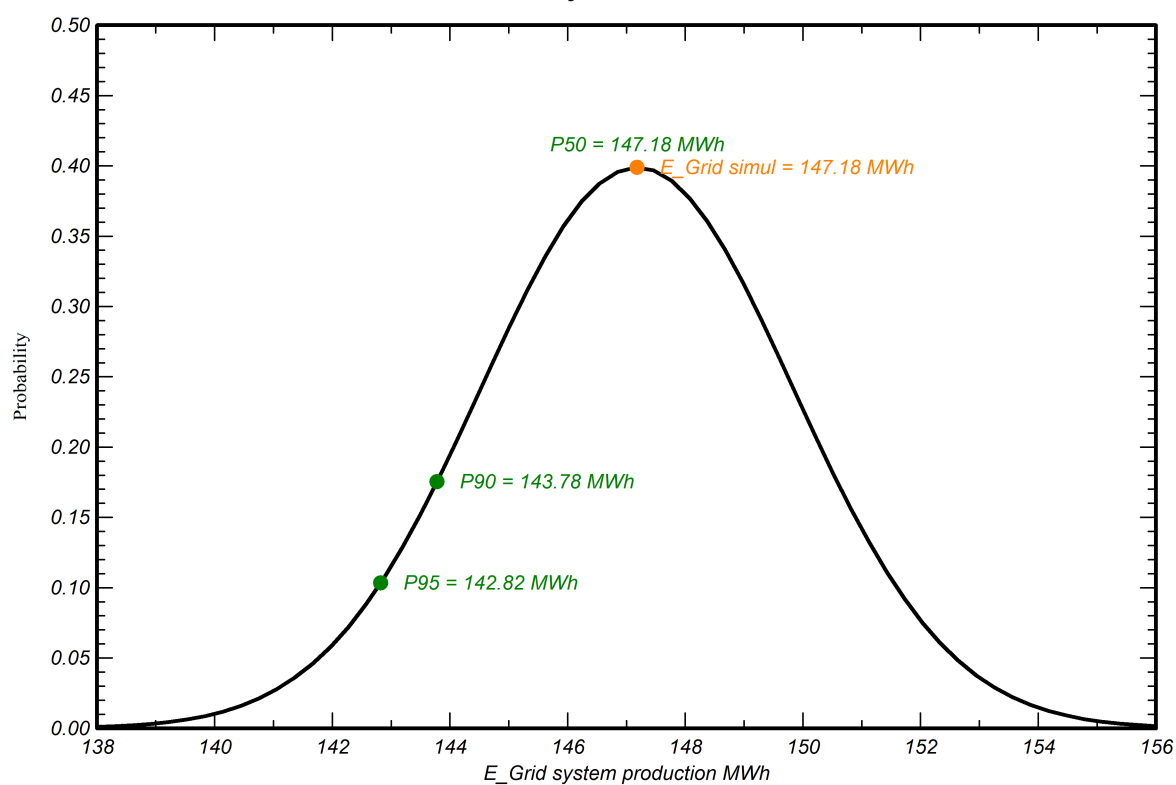
Simulation and parameters uncertainties

PV module modelling/parameters 1.0 %
Inverter efficiency uncertainty 0.5 %
Soiling and mismatch uncertainties 1.0 %
Degradation uncertainty 1.0 %

Annual production probability

Variability 2.65 MWh
P50 147.18 MWh
P90 143.78 MWh
P95 142.82 MWh

Probability distribution





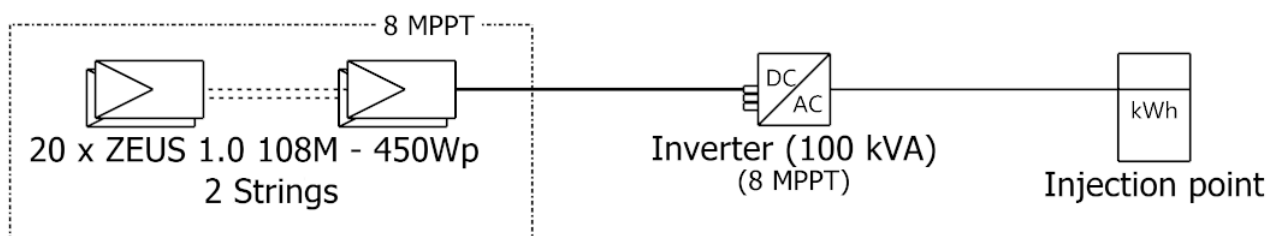
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Single-line diagram



PV module	ZEUS 1.0 108M - 450Wp
Inverter	Blueplanet-100-NX3-M8
String	20 x ZEUS 1.0 108M - 450Wp



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Pavyzdinė objekto analizė_v1

VC0 : New simulation variant

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Cost of the system**Installation costs**

Item	Quantity units	Cost EUR	Total EUR
PV modules ZEUS 1.0 108M - 450Wp	320	218.75	70000.00
		Total	70000.00
		Depreciable asset	70000.00

Operating costs

Item	Total EUR/year
Maintenance Provision for inverter replacement	1000.00
Total (OPEX)	1000.00
Including inflation (2.00%)	1352.27

System summary

Total installation cost	70000.00 EUR
Operating costs (incl. inflation 2.00%/year)	1352.27 EUR/year
Useful energy from solar	125 MWh/year
Energy sold to the grid	22.0 MWh/year
Cost of produced energy (LCOE)	0.0270 EUR/kWh

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Financial analysis**Simulation period**

Project lifetime 30 years Start year 2026

Income variation over timeInflation 2.00 %/year
Module Degradation Ageing tool results
Discount rate 0.00 %/year**Income dependent expenses**Income tax rate 0.00 %/year
Other income tax 0.00 %/year
Dividends 0.00 %/year**Depreciable assets**

Asset	Depreciation method	Depreciation period (years)	Salvage value (EUR)	Depreciable (EUR)
PV modules ZEUS 1.0 108M - 450Wp	Straight-line	20	0.00	70000.00
		Total	0.00	70000.00

Financing

Own funds 70000.00 EUR

Electricity saleFeed-in tariff 0.13000 EUR/kWh
Duration of tariff warranty 20 years
Annual connection tax 0.00 EUR/year
Annual tariff variation 0.0 %/year
Feed-in tariff decrease after warranty 0.00 %**Self-consumption**Consumption tariff 0.16000 EUR/kWh
Tariff evolution 0.0 %/year**Return on investment**Payback period 3.2 years
Net present value (NPV) 527163.94 EUR
Internal rate of return (IRR) 30.68 %
Return on investment (ROI) 753.1 %



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Financial analysis

Detailed economic results (EUR)

Year	Electricity sale	Own funds	Run. costs	Deprec. allow.	Taxable income	Taxes	After-tax profit	Self-cons. saving	Cumul. profit	% amorti.
0	0	70000	0	0	0	0	0	0	-70000	0.0%
1	2861	0	1000	3500	0	0	1861	19994	-48145	31.2%
2	2853	0	1020	3500	0	0	1833	19935	-26377	62.3%
3	2843	0	1040	3500	0	0	1803	19867	-4707	93.3%
4	2832	0	1061	3500	0	0	1771	19791	16855	124.1%
5	2820	0	1082	3500	0	0	1737	19706	38298	154.7%
6	2805	0	1104	3500	0	0	1701	19605	59605	185.1%
7	2789	0	1126	3500	0	0	1663	19491	80759	215.4%
8	2772	0	1149	3500	0	0	1624	19373	101755	245.4%
9	2755	0	1172	3500	0	0	1583	19253	122592	275.1%
10	2738	0	1195	3500	0	0	1543	19135	143270	304.7%
11	2723	0	1219	3500	0	0	1504	19031	163806	334.0%
12	2711	0	1243	3500	0	0	1467	18943	184217	363.2%
13	2699	0	1268	3500	0	0	1431	18860	204507	392.2%
14	2688	0	1294	3500	0	0	1394	18781	224683	421.0%
15	2677	0	1319	3500	0	0	1357	18705	244745	449.6%
16	2667	0	1346	3500	0	0	1321	18636	264702	478.1%
17	2658	0	1373	3500	0	0	1285	18571	284558	506.5%
18	2648	0	1400	3500	0	0	1247	18503	304308	534.7%
19	2637	0	1428	3500	0	0	1209	18427	323944	562.8%
20	2625	0	1457	3500	0	0	1168	18341	343453	590.6%
21	2608	0	1486	0	1122	0	1122	18227	362802	618.3%
22	2588	0	1516	0	1072	0	1072	18085	381960	645.7%
23	2566	0	1546	0	1020	0	1020	17930	400910	672.7%
24	2542	0	1577	0	965	0	965	17766	419641	699.5%
25	2517	0	1608	0	909	0	909	17593	438143	725.9%
26	2493	0	1641	0	852	0	852	17420	456415	752.0%
27	2468	0	1673	0	795	0	795	17248	474457	777.8%
28	2443	0	1707	0	736	0	736	17073	492266	803.2%
29	2417	0	1741	0	676	0	676	16894	509837	828.3%
30	2391	0	1776	0	616	0	616	16712	527164	853.1%
Total	79834	70000	40568	70000	8764	0	39266	557898	527164	853.1%



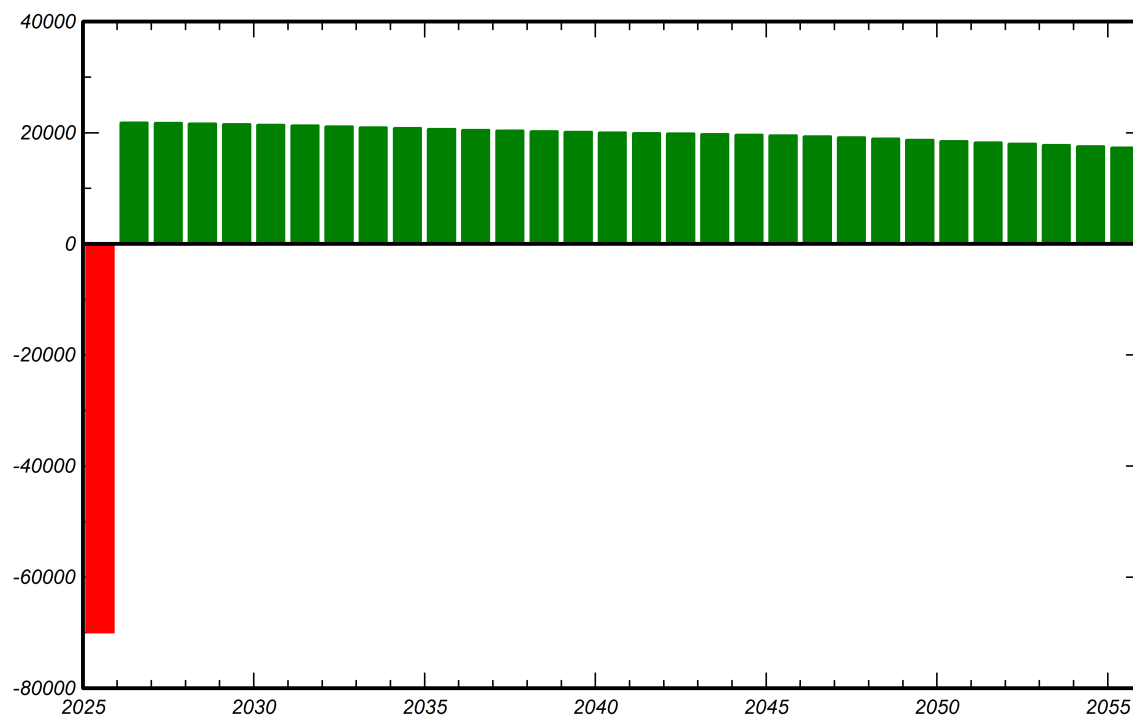
PVsyst V8.0.17

VC0, Simulation date:
28/10/25 13:33
with V8.0.17

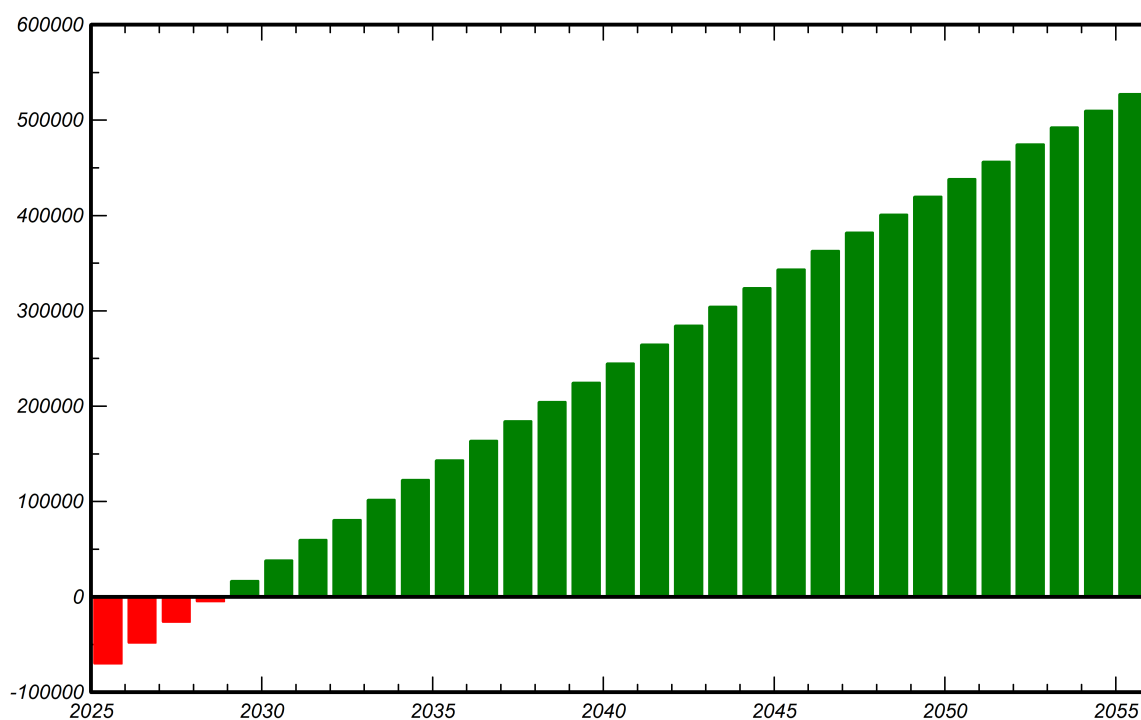
MMSystems, UAB (Lithuania)

Financial analysis

Yearly net profit (EUR)



Cumulative cashflow (EUR)





PVsyst V8.0.17

VC0, Simulation date:
28/10/25 13:33
with V8.0.17

MMSystems, UAB (Lithuania)

CO₂ Emission Balance

Total: 393.3 tCO₂

Generated emissions

Total: 250.33 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 741.8 tCO₂

System production: 147.18 MWh/yr

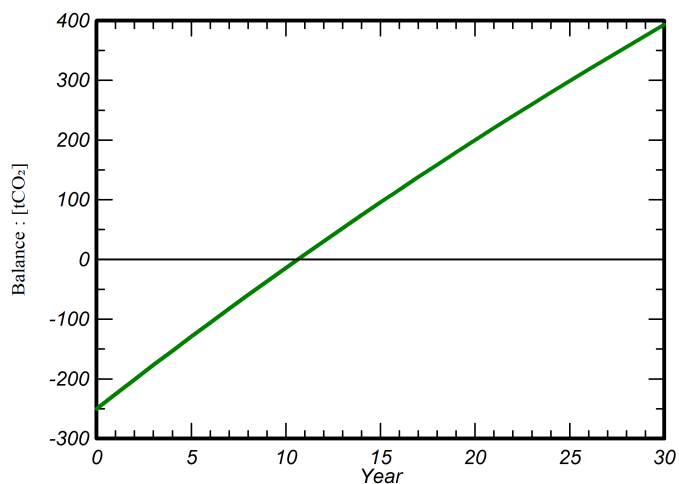
Grid Lifecycle Emissions: 168 gCO₂/kWh

Source: IEA List

Country: Lithuania

Lifetime: 30 years

Annual degradation: 1.0 %

Saved CO₂ Emission vs. Time**System Lifecycle Emissions Details**

Item	LCE	Quantity	Subtotal
			[kgCO ₂]
Modules	1713 kgCO ₂ /kWp	144 kWp	246632
Supports	1.12 kgCO ₂ /kg	3200 kg	3586
Inverters	111 kgCO ₂ /units	1.00 units	111