

PVsyst - Simulation report

Grid-Connected System

Project: UAB „VAATC“

Variant: 5

Tables on a building

System power: 99.8 kWp

Vidugirių k. 3 21364 Vidugiriai, Elektrėnų sav. - Lithuania

Author

UAB „Elektra man“ (Lithuania)

**PVsyst V7.2.4**

VC5, Simulation date:
29/07/21 17:55
with v7.2.4

UAB „Elektra man“ (Lithuania)

Project summary**Geographical Site**

Vidugirių k. 3 21364 Vidugiriai, Elektrėnų sav.
Lithuania

Situation

Latitude 54.81 °N
Longitude 24.82 °E
Altitude 145 m
Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Vidugirių k. 3 21364 Vidugiriai, Elektrėnų sav.
Meteonorm 8.0 (2007-2017), Sat=100% - Synthetic

System summary**Grid-Connected System****PV Field Orientation**

Fixed planes 2 orientations
Tilts/azimuths 11 / -18 °
6 / -18 °

Tables on a building**Near Shadings**

Linear shadings

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules 266 units
Pnom total 99.8 kWp

Inverters

Nb. of units 2.6 units
Pnom total 78.7 kWac
Pnom ratio 1.268

Results summary

Produced Energy 94837 kWh/year Specific production 951 kWh/kWp/year Perf. Ratio PR 86.88 %

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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed planes 2 orientations
Tilts/azimuths 11 / -18 °
6 / -18 °

Horizon

Free Horizon

Tables on a building

Sheds configuration

Nb. of sheds 266 units

Sizes

Sheds spacing 1.74 m
Collector width 1.76 m
Ground Cov. Ratio (GCR) 100.7 %

Shading limit angle

Limit profile angle 86.6 °

Near Shadings

Linear shadings

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer Longi Solar
Model LR4-60-HPH 375 M

(Custom parameters definition)

Unit Nom. Power 375 Wp
Number of PV modules 139 units
Nominal (STC) 52.1 kWp

Array #1 - PV Array

Orientation #1
Tilt/Azimuth 11/-18 °
Number of PV modules 19 units
Nominal (STC) 7.13 kWp
Modules 1 String x 19 In series

At operating cond. (50°C)

Pmpp 6.51 kWp
U mpp 589 V
I mpp 11 A

Array #2 - Sub-array #8

Orientation #1
Tilt/Azimuth 11/-18 °
Number of PV modules 20 units
Nominal (STC) 7.50 kWp
Modules 1 String x 20 In series

At operating cond. (50°C)

Pmpp 6.85 kWp
U mpp 620 V
I mpp 11 A

Array #3 - Sub-array #2

Orientation #1
Tilt/Azimuth 11/-18 °
Number of PV modules 44 units
Nominal (STC) 16.50 kWp
Modules 2 Strings x 22 In series

Inverter

Manufacturer Huawei Technologies
Model SUN2000-50KTL-M0

(Custom parameters definition)

Unit Nom. Power 50.0 kWac
Number of inverters 0.8 Unit
Total power 41.7 kWac

Operating voltage 200-1000 V
Pnom ratio (DC:AC) 0.86

Number of inverters 1 * MPPT 17% 0.2 units
Total power 8.3 kWac

Operating voltage 200-1000 V
Pnom ratio (DC:AC) 0.90

Number of inverters 1 * MPPT 17% 0.2 units
Total power 8.3 kWac



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PV Array Characteristics

At operating cond. (50°C)

Pmpp	15.08 kWp
U mpp	682 V
I mpp	22 A

Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.98

Array #4 - Sub-array #4

Orientation	#1
Tilt/Azimuth	11/-18 °
Number of PV modules	28 units
Nominal (STC)	10.50 kWp
Modules	2 Strings x 14 In series

Number of inverters	1 * MPPT 17% 0.2 units
Total power	8.3 kWac

At operating cond. (50°C)

Pmpp	9.60 kWp
U mpp	434 V
I mpp	22 A

Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.26

Array #5 - Sub-array #5

Orientation	#1
Tilt/Azimuth	11/-18 °
Number of PV modules	28 units
Nominal (STC)	10.50 kWp
Modules	2 Strings x 14 In series

Number of inverters	1 * MPPT 17% 0.2 units
Total power	8.3 kWac

At operating cond. (50°C)

Pmpp	9.60 kWp
U mpp	434 V
I mpp	22 A

Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.26

PV module

Manufacturer	Longi Solar
Model	LR4-60-HPH 375 M

(Custom parameters definition)

Unit Nom. Power	375 Wp
Number of PV modules	27 units
Nominal (STC)	10.13 kWp

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-10KTL-M0

(Custom parameters definition)

Unit Nom. Power	10.00 kWac
Number of inverters	1 Unit
Total power	10.0 kWac

Array #6 - Sub-array #6

Orientation	#1
Tilt/Azimuth	11/-18 °
Number of PV modules	13 units
Nominal (STC)	4875 Wp
Modules	1 String x 13 In series

Number of inverters	1 * MPPT 50% 0.5 units
Total power	5.0 kWac

At operating cond. (50°C)

Pmpp	4455 Wp
U mpp	403 V
I mpp	11 A

Operating voltage	200-850 V
Pnom ratio (DC:AC)	0.98

Array #7 - Sub-array #7

Orientation	#1
Tilt/Azimuth	11/-18 °
Number of PV modules	14 units
Nominal (STC)	5.25 kWp
Modules	1 String x 14 In series

Number of inverters	1 * MPPT 50% 0.5 units
Total power	5.0 kWac

At operating cond. (50°C)

Pmpp	4798 Wp
U mpp	434 V
I mpp	11 A

Operating voltage	200-850 V
Pnom ratio (DC:AC)	1.05



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PV Array Characteristics

Array #8 - Sub-array #7

Orientation #2
Tilt/Azimuth 6/-18 °

PV module

Manufacturer Longi Solar
Model LR4-60-HPH 375 M

(Custom parameters definition)

Unit Nom. Power 375 Wp
Number of PV modules 100 units
Nominal (STC) 37.5 kWp
Modules 5 Strings x 20 In series

At operating cond. (50°C)

Pmpp 34.3 kWp
U mpp 620 V
I mpp 55 A

Total PV power

Nominal (STC) 100 kWp
Total 266 modules
Module area 485 m²
Cell area 440 m²

Inverter

Manufacturer Huawei Technologies
Model SUN2000-36KTL-M3-400V-Preliminary V0.2

(Custom parameters definition)

Unit Nom. Power 36.0 kWac
Number of inverters 3 * MPPT 25% 0.8 units
Total power 27.0 kWac
Operating voltage 200-1000 V
Max. power (=>45°C) 40.0 kWac
Pnom ratio (DC:AC) 1.39

Total inverter power

Total power 79 kWac
Nb. of inverters 3 units
0.4 unused
Pnom ratio 1.27



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Array losses

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 20.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation

Loss Fraction 1.0 %

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

Incidence effect (IAM): User defined profile

0°	25°	45°	60°	65°	70°	75°	80°	90°
1.000	1.000	0.995	0.962	0.936	0.903	0.851	0.754	0.000

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.0 % at STC

Array #1 - PV Array

Global array res. 588 mΩ
Loss Fraction 1.0 % at STC

Array #3 - Sub-array #2

Global array res. 341 mΩ
Loss Fraction 1.0 % at STC

Array #5 - Sub-array #5

Global array res. 217 mΩ
Loss Fraction 1.0 % at STC

Array #7 - Sub-array #7

Global array res. 433 mΩ
Loss Fraction 1.0 % at STC

Array #2 - Sub-array #8

Global array res. 619 mΩ
Loss Fraction 1.0 % at STC

Array #4 - Sub-array #4

Global array res. 217 mΩ
Loss Fraction 1.0 % at STC

Array #6 - Sub-array #6

Global array res. 402 mΩ
Loss Fraction 1.0 % at STC

Array #8 - Sub-array #7

Global array res. 124 mΩ
Loss Fraction 1.0 % at STC

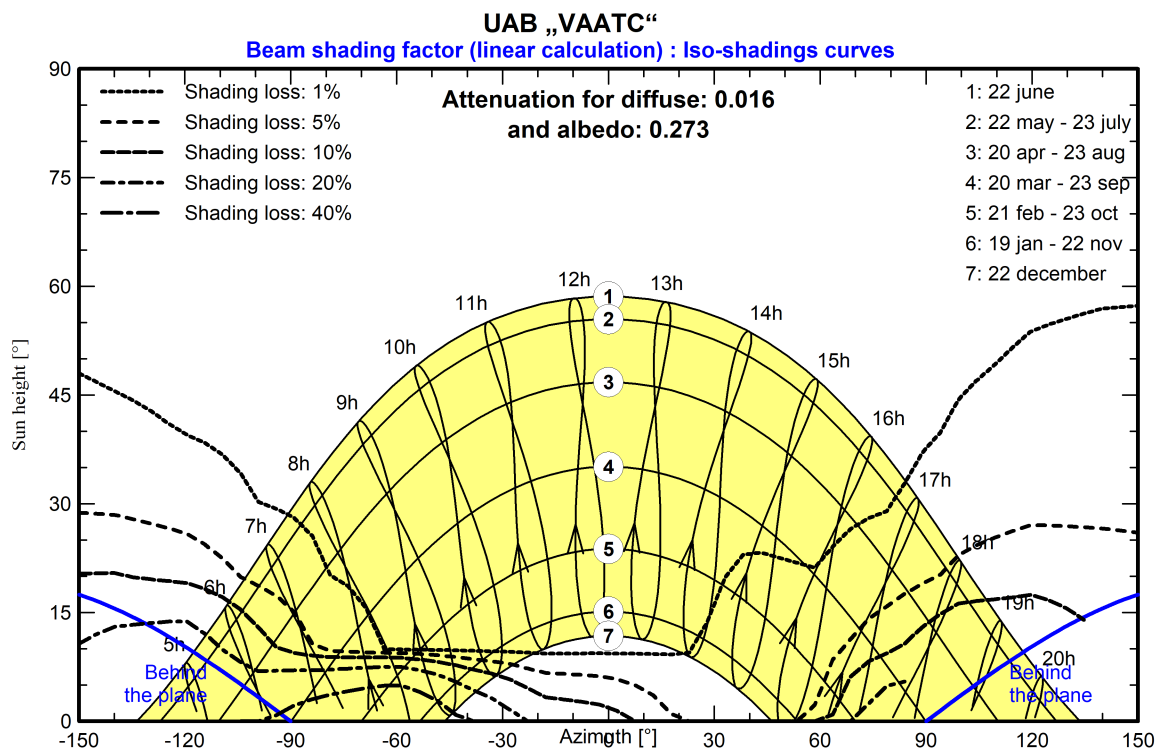


Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram





Main results

System Production

Produced Energy

94837 kWh/year

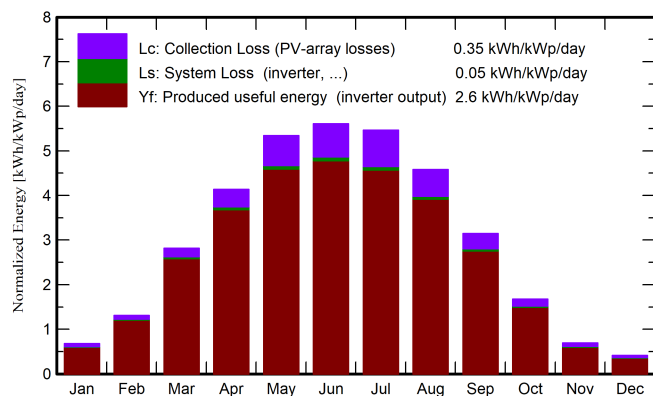
Specific production

951 kWh/kWp/year

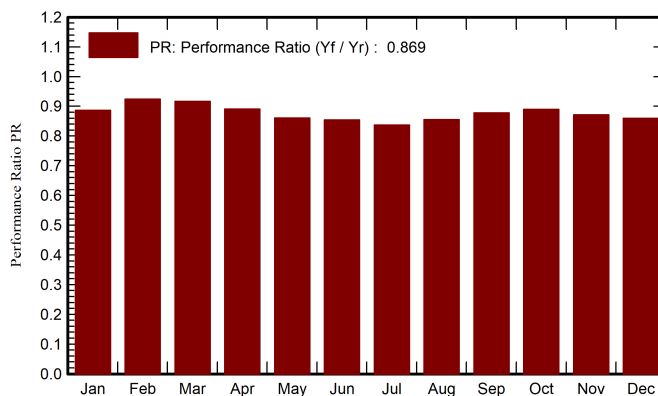
Performance Ratio PR

86.88 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	16.3	10.94	-4.14	20.9	19.2	1902	1853	0.887
February	31.5	21.32	-3.41	36.6	34.5	3447	3378	0.924
March	78.0	41.37	0.77	87.4	83.4	8133	7991	0.917
April	115.9	60.66	7.44	124.1	119.6	11226	11036	0.891
May	160.7	81.37	13.45	165.7	159.9	14462	14220	0.860
June	164.6	83.66	16.21	168.2	162.5	14573	14325	0.854
July	164.8	78.43	19.11	169.4	163.6	14381	14137	0.837
August	134.6	70.48	18.01	142.0	137.1	12326	12120	0.855
September	85.6	42.77	12.47	94.3	90.4	8406	8260	0.878
October	45.3	27.25	6.66	52.0	49.0	4705	4617	0.890
November	17.3	11.90	2.58	20.7	19.2	1850	1801	0.872
December	10.4	8.08	-1.28	12.8	11.7	1135	1097	0.859
Year	1025.1	538.23	7.39	1094.3	1050.2	96547	94837	0.869

Legends

GlobHor Global horizontal irradiation

DiffHor Horizontal diffuse irradiation

T_Amb Ambient Temperature

GlobInc Global incident in coll. plane

GlobEff Effective Global, corr. for IAM and shadings

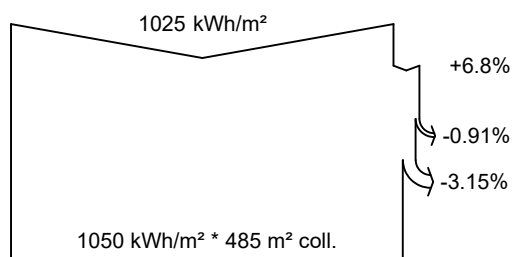
EArray Effective energy at the output of the array

E_Grid Energy injected into grid

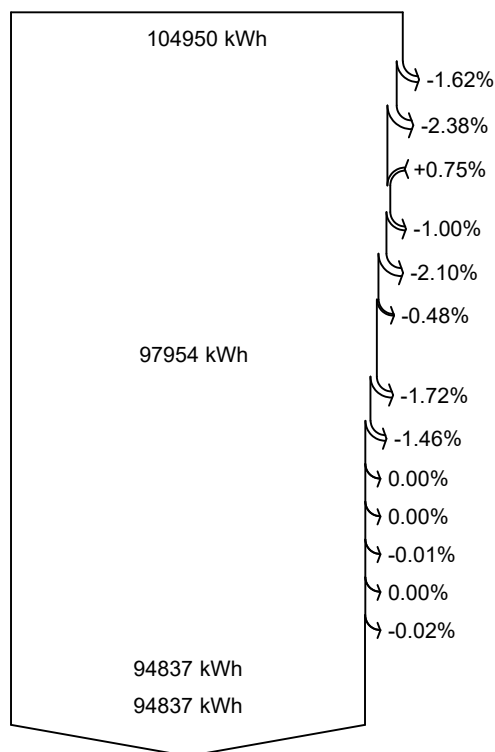
PR Performance Ratio



Loss diagram



efficiency at STC = 20.62%



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module quality loss

LID - Light induced degradation

Mismatch loss, modules and strings

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

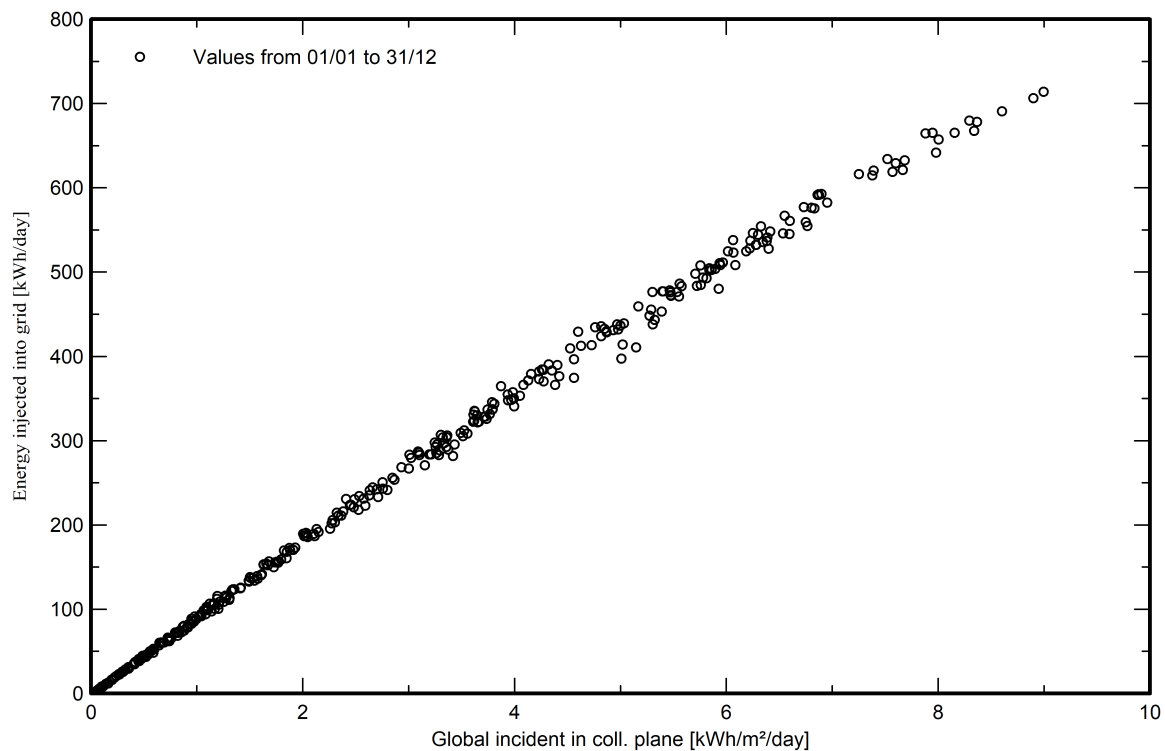
Available Energy at Inverter Output

Energy injected into grid



Special graphs

Daily Input/Output diagram



System Output Power Distribution

