

PVsyst - Simulation report

Grid-Connected System

Project: Al-Bakri School

Variant: PV Simulation

Sheds on ground

System power: 22.86 kWp

Hebron - Palestine, State Of



Project: Al-Bakri School

Variant: PV Simulation

PVsyst V7.3.1

VC0, Simulation date:
03/31/26 11:26
with v7.3.1

Project summary

Geographical Site

Hebron
Palestine, State Of

Situation

Latitude 31.53 °N
Longitude 35.09 °E
Altitude 896 m
Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Hebron
Meteonorm 8.1 (2006-2011), Sat=100% - Synthetic

System summary

Grid-Connected System

Simulation for year no 1

Sheds on ground

PV Field Orientation

Fixed plane
Tilt/Azimuth 28 / 28 °

Near Shadings

Detailed electrical calculation
acc. to module layout

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 36 units
Pnom total 22.86 kWp

Inverters

Nb. of units 1 unit
Pnom total 21.00 kWac
Pnom ratio 1.089

Results summary

Produced Energy	38542 kWh/year	Specific production	1686 kWh/kWp/year	Perf. Ratio PR	83.12 %
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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth 28 / 28 °

Horizon

Free Horizon

Sheds on ground

Sheds configuration

Nb. of sheds 2 units

Sizes

Sheds spacing 11.0 m

Collector width 4.80 m

Ground Cov. Ratio (GCR) 43.7 %

Shading limit angle

Limit profile angle 18.5 °

Near Shadings

Detailed electrical calculation
acc. to module layout

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics

Array #1 - PV Array#1

PV module

Manufacturer Trina Solar

Model TSM-DEG21C-20-635Wp Vertex

(Original PVsyst database)

Unit Nom. Power 635 Wp

Number of PV modules 18 units

Nominal (STC) 11.43 kWp

Modules 1 String x 18 In series

At operating cond. (50°C)

Pmpp 10.48 kWp

U mpp 608 V

I mpp 17 A

Array #2 - Sub-array #2

PV module

Manufacturer Trina Solar

Model TSM-DEG21C-20-635Wp Vertex

(Original PVsyst database)

Unit Nom. Power 635 Wp

Number of PV modules 18 units

Nominal (STC) 11.43 kWp

Modules 1 String x 18 In series

At operating cond. (50°C)

Pmpp 10.48 kWp

U mpp 608 V

I mpp 17 A

Total PV power

Nominal (STC) 23 kWp

Total 36 modules

Module area 112 m²

Inverter

Manufacturer Growatt New Energy

Model MID 22KTL3-X

(Original PVsyst database)

Unit Nom. Power 22.0 kWac

Number of inverters 1 * MPPT 50% 0.5 unit

Total power 11.0 kWac

Operating voltage 160-1000 V

Pnom ratio (DC:AC) 1.04

Inverter

Manufacturer Growatt New Energy

Model MID 20KTL3-X

(Original PVsyst database)

Unit Nom. Power 20.0 kWac

Number of inverters 1 * MPPT 50% 0.5 unit

Total power 10.0 kWac

Operating voltage 160-1000 V

Pnom ratio (DC:AC) 1.14

Total inverter power

Total power 21 kWac

Number of inverters 1 unit

Pnom ratio 1.09

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Array losses**Array Soiling Losses**

Loss Fraction 2.0 %

LID - Light Induced Degradation

Loss Fraction 2.0 %

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, $n(\text{glass})=1.526$, $n(\text{AR})=1.290$

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

Module Quality Loss

Loss Fraction -0.4 %

Module average degradation

Year no 1

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year

Vmp RMS dispersion 0.4 %/year

DC wiring losses

Global array res. 579 mΩ

Global wiring resistance 290 mΩ

Loss Fraction 1.5 % at STC

Module mismatch losses

Loss Fraction 2.0 % at MPP

AC wiring losses**Inv. output line up to injection point**

Inverter voltage 400 Vac tri

Loss Fraction 0.41 % at STC

Inverter: MID 22KTL3-X

Wire section (1 Inv.) Copper 1 x 3 x 16 mm²

Wires length 50 m

Inverter: MID 20KTL3-X

Wire section (1 Inv.)

Wires length Copper 1 x 3 x 4 mm² 0 m

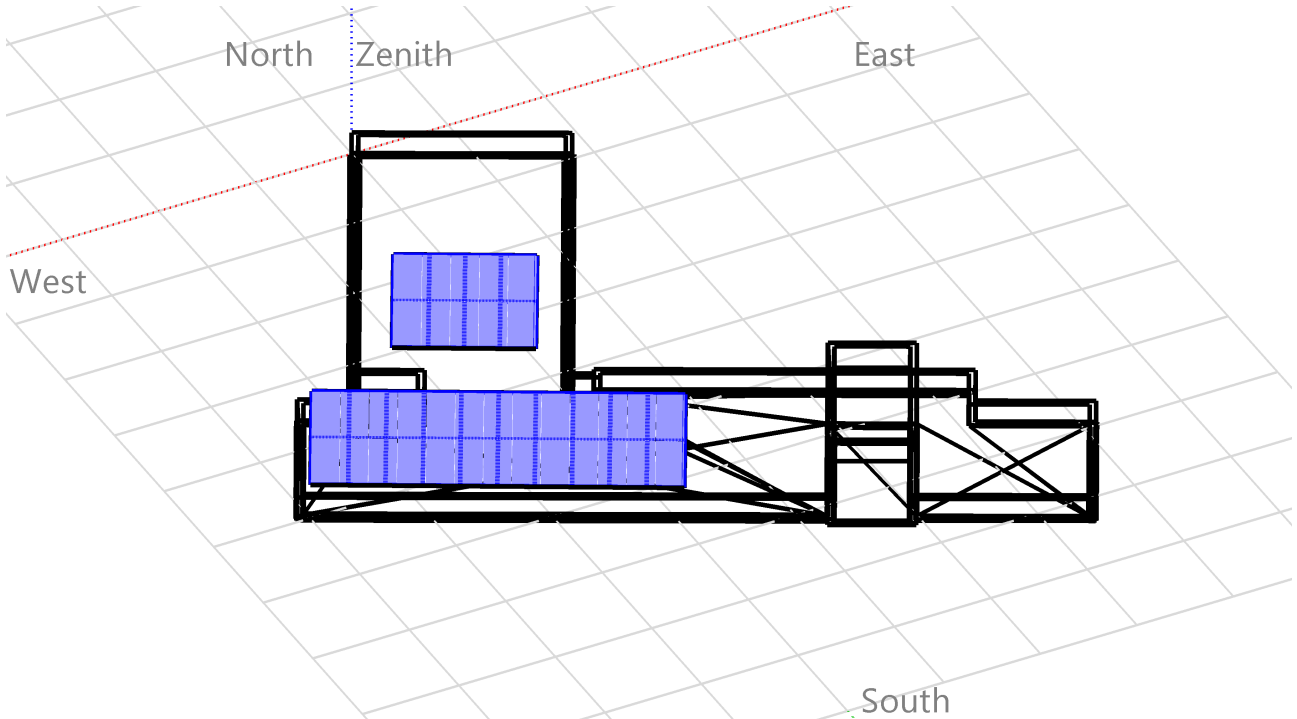


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Near shadings parameter

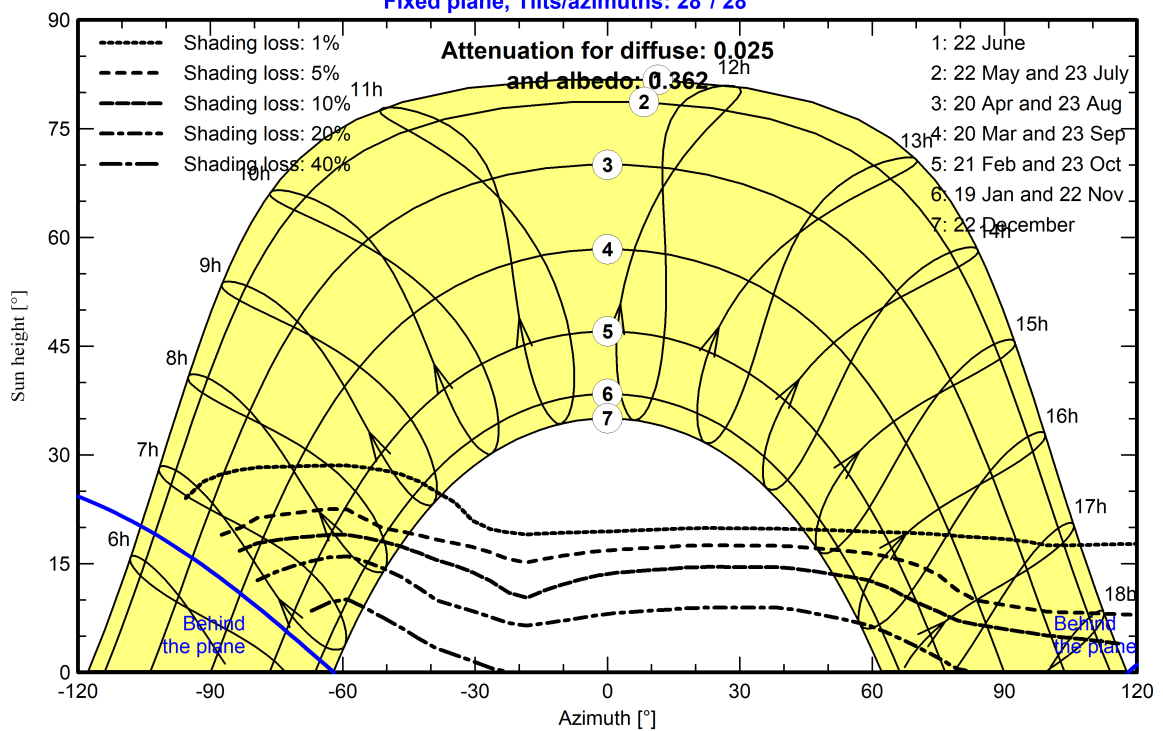
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 28°/ 28°





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Main results

System Production

Produced Energy 38542 kWh/year

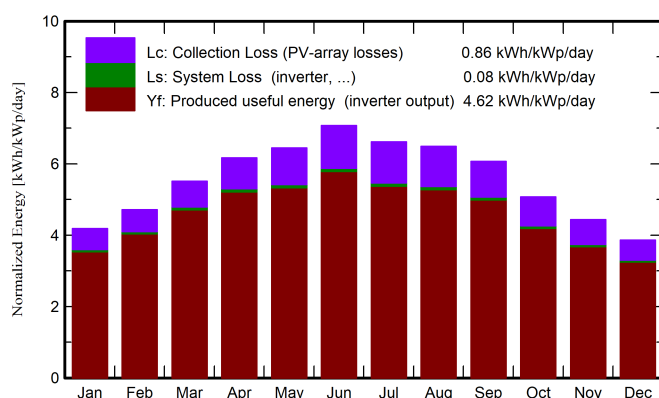
Specific production

1686 kWh/kWp/year

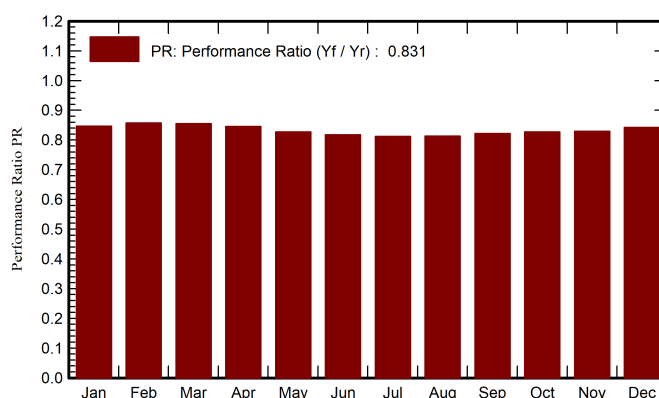
Performance Ratio PR

83.12 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m²	kWh/m²	°C	kWh/m²	kWh/m²	kWh	kWh	ratio
January	94.8	37.06	7.18	129.6	121.9	2550	2509	0.847
February	104.1	43.01	8.87	132.0	124.9	2628	2586	0.857
March	152.1	62.56	12.59	171.0	162.8	3399	3343	0.855
April	180.4	69.35	16.63	185.1	176.2	3637	3577	0.845
May	212.0	75.16	21.47	199.9	189.5	3844	3783	0.828
June	233.9	60.06	24.19	212.2	201.4	4035	3968	0.818
July	222.0	67.97	26.36	205.2	194.8	3874	3809	0.812
August	202.5	61.87	26.15	201.2	191.5	3805	3742	0.814
September	167.9	58.75	23.53	182.2	173.5	3480	3423	0.822
October	131.3	53.11	20.25	157.2	149.2	3022	2973	0.827
November	97.4	35.33	13.93	133.1	125.8	2568	2524	0.830
December	85.5	37.32	9.21	119.7	112.3	2342	2305	0.842
Year	1883.8	661.54	17.58	2028.5	1923.7	39186	38542	0.831

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

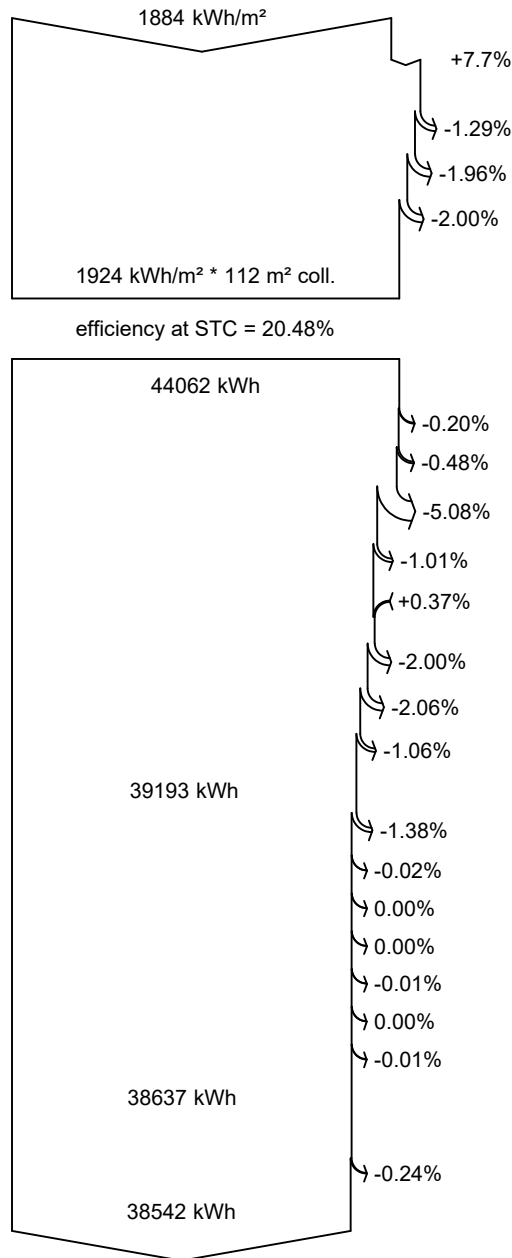
PR Performance Ratio



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

Module Degradation Loss (for year #1)

PV loss due to irradiance level

PV loss due to temperature

Shadings: Electrical Loss detailed module calc.

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

AC ohmic loss

Energy injected into grid

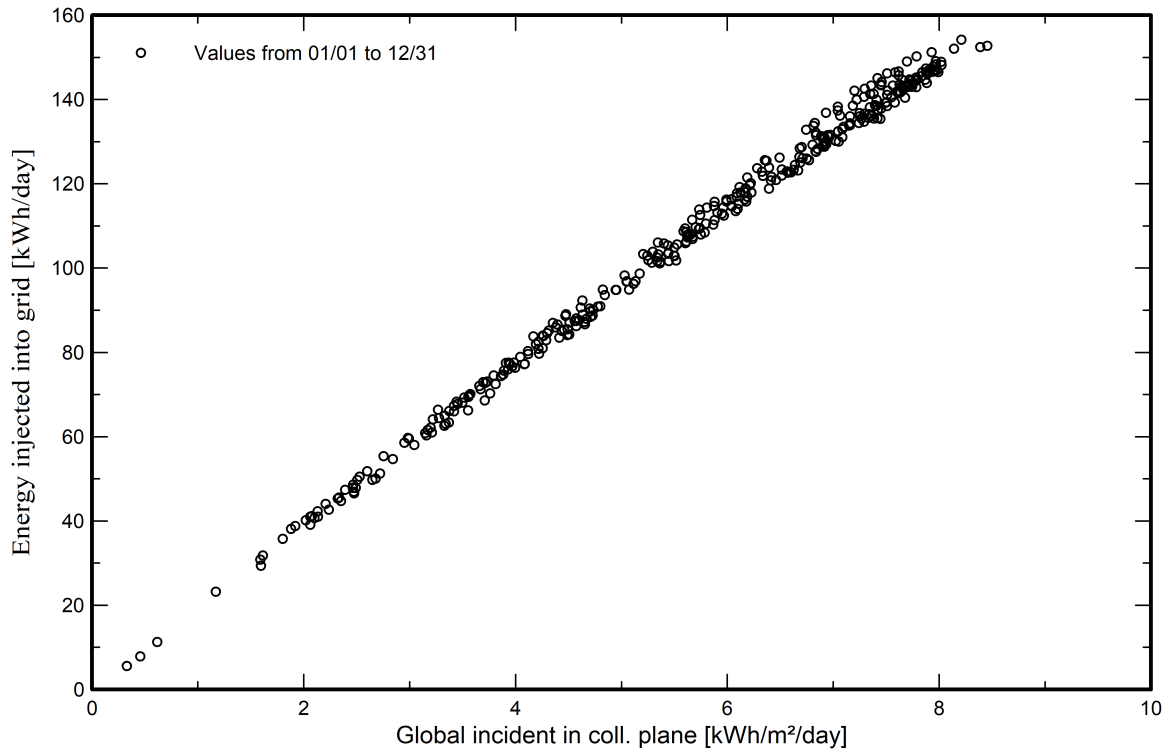


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Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

