

PVsyst - Simulation report

Grid-Connected System

Project: LBH - Winston Churchill Theatre

Variant: New simulation variant

Building system

System power: 39.8 kWp

Hillingdon - United Kingdom

Author

Ameresco (USA)



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PVsyst V7.4.0

VC0, Simulation date:
31/07/23 20:41
with v7.4.0

Ameresco (USA)

Project summary

Geographical Site

Hillingdon
United Kingdom

Situation

Latitude 51.53 °N
Longitude -0.45 °W
Altitude 43 m
Time zone UTC

Project settings

Albedo 0.20

Meteo data

Hillingdon
Meteonorm 8.1 (1991-2006), Sat=35% - Synthetic

System summary

Grid-Connected System

PV Field Orientation

Fixed plane
Tilt/Azimuth 20 / -20 °

Building system

Near Shadings

Linear shadings

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 97 units
Pnom total 39.8 kWp

Inverters

Nb. of units 1 unit
Pnom total 40.0 kWac
Pnom ratio 0.994

Results summary

Produced Energy 37620 kWh/year Specific production 946 kWh/kWp/year Perf. Ratio PR 82.87 %

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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth 20 / -20 °

Horizon

Free Horizon

Building system

Sheds configuration

Near Shadings

Linear shadings

Models used

Transposition Perez
Diffuse Perez, Meteor
Circumsolar norm
separate

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer

Hanwha Q Cells

Model

Q.PEAK-DUO-ML-G10-410

(Custom parameters definition)

Unit Nom. Power

410 Wp

Number of PV modules

97 units

Nominal (STC)

39.8 kWp

Array #1 - PV Array

Number of PV modules

64 units

Nominal (STC)

26.24 kWp

Modules

4 Strings x 16 In series

At operating cond. (50°C)

Pmpp

23.94 kWp

U mpp

556 V

I mpp

43 A

Array #2 - Sub-array #2

Number of PV modules

15 units

Nominal (STC)

6.15 kWp

Modules

1 String x 15 In series

At operating cond. (50°C)

Pmpp

5.61 kWp

U mpp

522 V

I mpp

11 A

Array #3 - Sub-array #3

Number of PV modules

18 units

Nominal (STC)

7.38 kWp

Modules

1 String x 18 In series

At operating cond. (50°C)

Pmpp

6.73 kWp

U mpp

626 V

I mpp

11 A

Total PV power

Nominal (STC)

40 kWp

Total

97 modules

Module area

190 m²

Inverter

Manufacturer

Ginlong Technologies

Model

Solis-40K-5G

(Custom parameters definition)

Unit Nom. Power

40.0 kWac

Number of inverters

1 unit

Total power

40.0 kWac

Number of inverters

2 * MPPT 25% 0.5 unit

Total power

20.0 kWac

Operating voltage

200-800 V

Pnom ratio (DC:AC)

1.31

Number of inverters

1 * MPPT 25% 0.3 unit

Total power

10.0 kWac

Operating voltage

200-800 V

Pnom ratio (DC:AC)

0.62

Number of inverters

1 * MPPT 25% 0.3 unit

Total power

10.0 kWac

Operating voltage

200-800 V

Pnom ratio (DC:AC)

0.74

Total inverter power

Total power

40 kWac

Number of inverters

1 unit

Pnom ratio

0.99

No power sharing



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Array losses

Array Soiling Losses

Loss Fraction 2.5 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 15.0 W/m²KUv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation

Loss Fraction 1.6 %

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Array #1 - PV Array

Loss Fraction 2.0 % at MPP

Array #2 - Sub-array #2

Loss Fraction 2.0 % at MPP

Array #3 - Sub-array #3

Loss Fraction 2.0 % at MPP

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	0.962	0.892	0.816	0.681	0.440	0.000

DC wiring losses

Global wiring resistance 10 mΩ

Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 213 mΩ

Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 799 mΩ

Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 959 mΩ

Loss Fraction 1.5 % at STC

AC wiring losses

Inv. output line up to injection point

Inverter voltage 400 Vac tri

Loss Fraction 0.62 % at STC

Inverter: Solis-40K-5G

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

Wires length 25 m

Inverter: Solis-40K-5G

Wire section (1 Inv.)

Copper 1 x 3 x 6 mm²

Wires length

0 m

Inverter: Solis-40K-5G

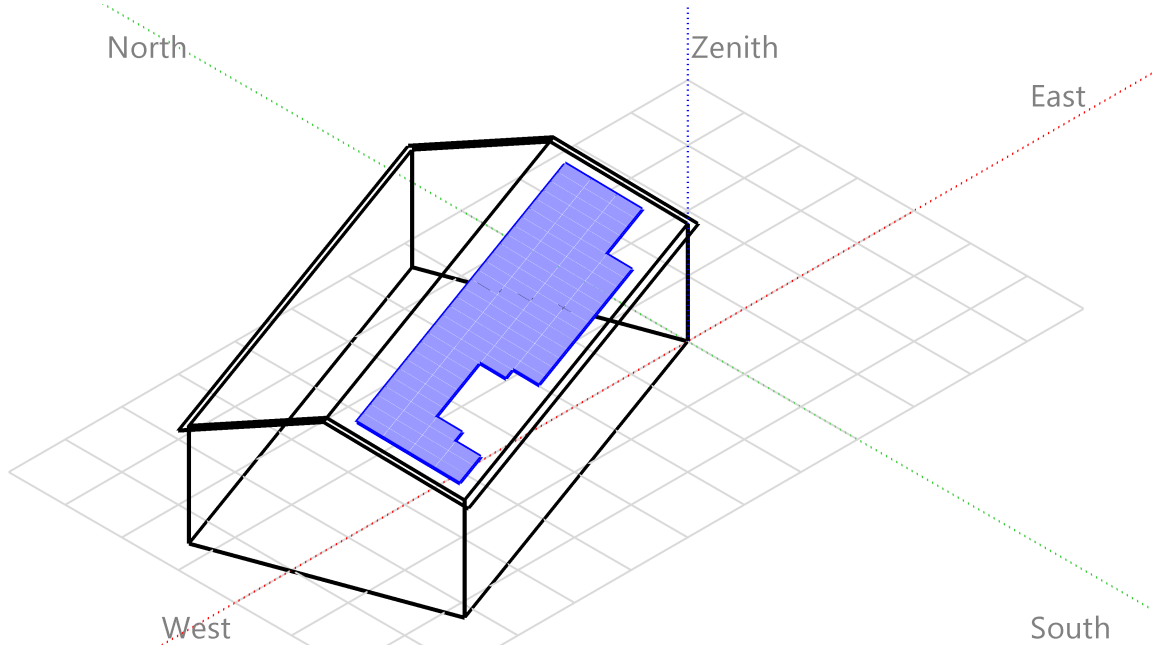
Wire section (1 Inv.) Copper 1 x 3 x 10 mm²

Wires length 0 m



Near shadings parameter

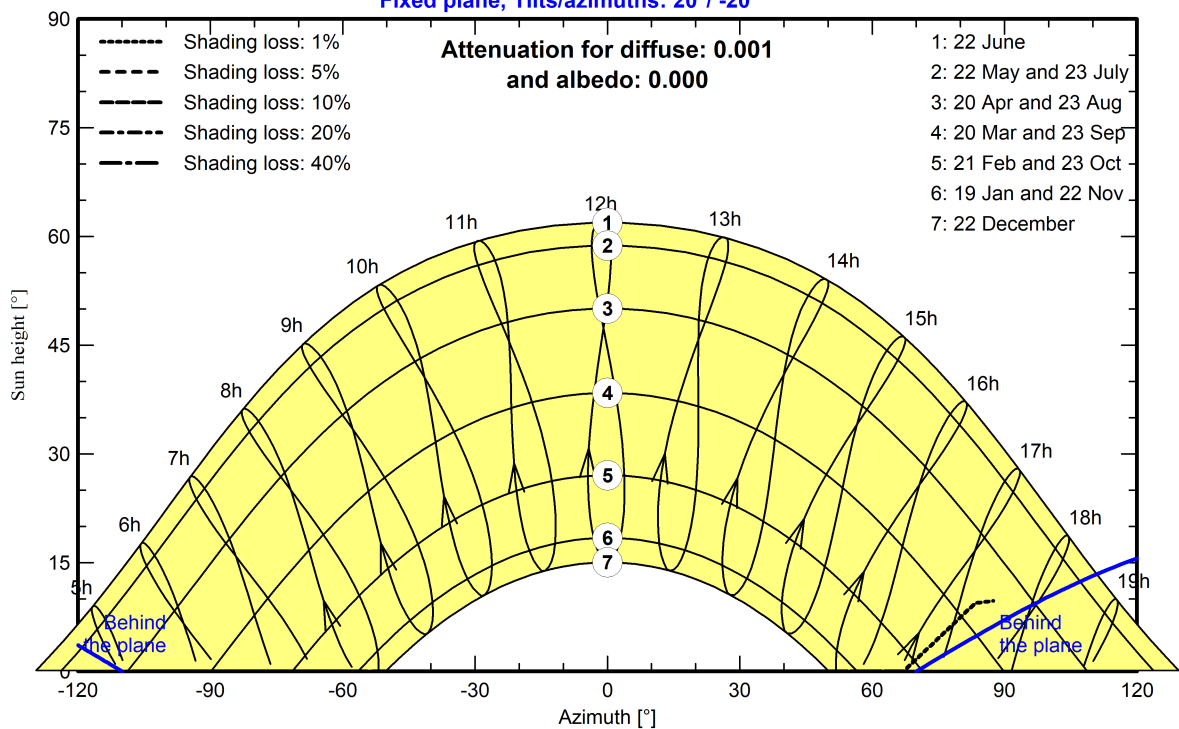
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 20°/-20°





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Main results

System Production

Produced Energy

37620 kWh/year

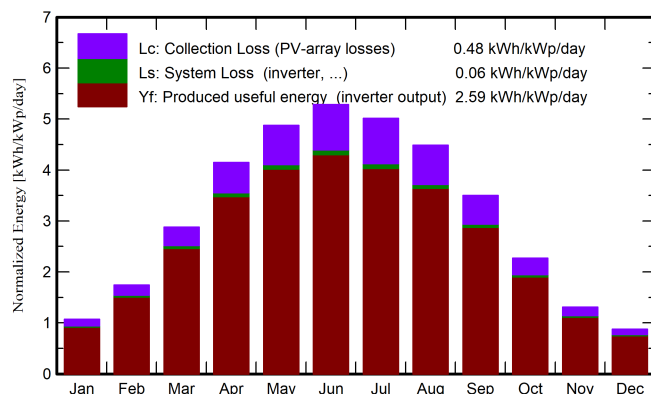
Specific production

946 kWh/kWp/year

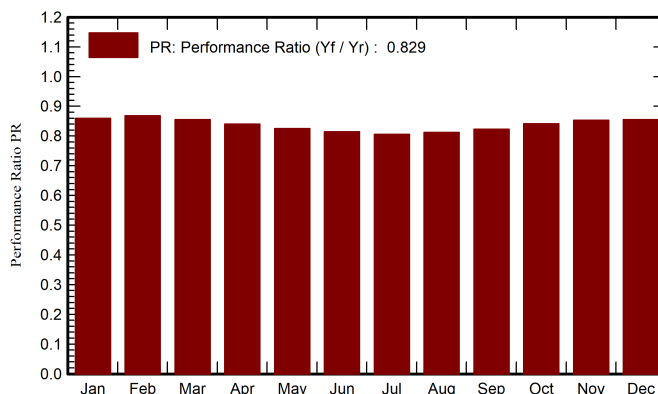
Perf. Ratio PR

82.87 %

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	22.1	14.33	5.33	33.2	31.0	1169	1135	0.860
February	36.4	21.70	5.42	48.7	45.9	1725	1683	0.868
March	73.5	41.09	7.34	89.3	84.5	3106	3036	0.855
April	112.7	62.73	9.89	124.4	118.1	4247	4157	0.840
May	145.3	77.31	13.27	151.1	143.3	5068	4961	0.825
June	154.8	84.88	16.49	158.5	150.5	5248	5137	0.815
July	152.8	79.66	18.84	155.4	147.2	5087	4977	0.805
August	129.6	72.02	18.10	139.1	131.7	4590	4494	0.812
September	90.2	47.41	15.20	105.0	99.5	3511	3435	0.823
October	55.1	32.30	12.05	70.4	66.2	2408	2354	0.841
November	27.8	18.19	8.01	39.2	36.6	1366	1330	0.853
December	17.7	11.85	5.96	27.1	25.3	953	922	0.856
Year	1018.1	563.46	11.36	1141.4	1079.8	38476	37620	0.829

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

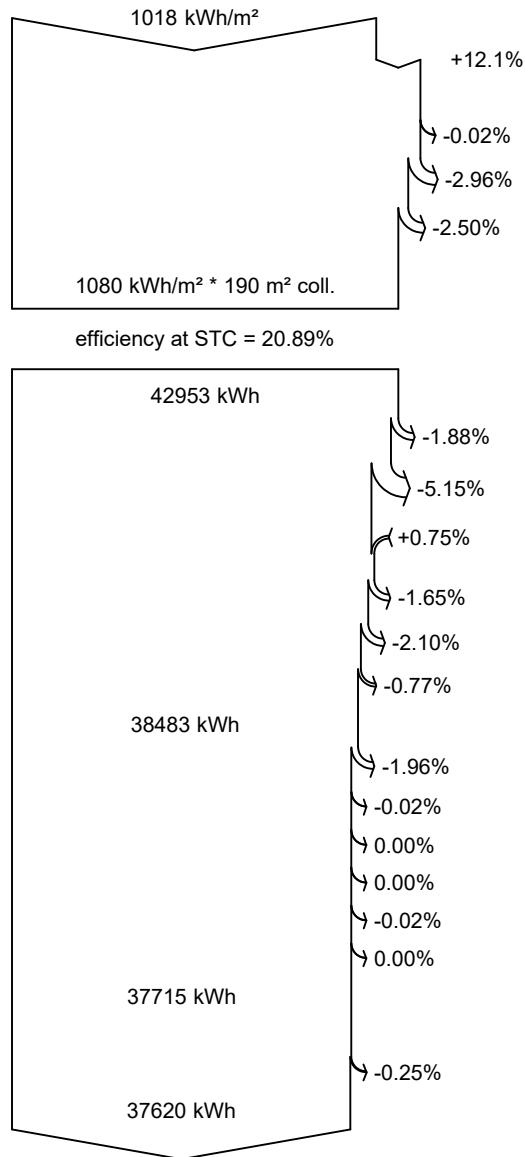
EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



Loss diagram



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.)

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

Available Energy at Inverter Output

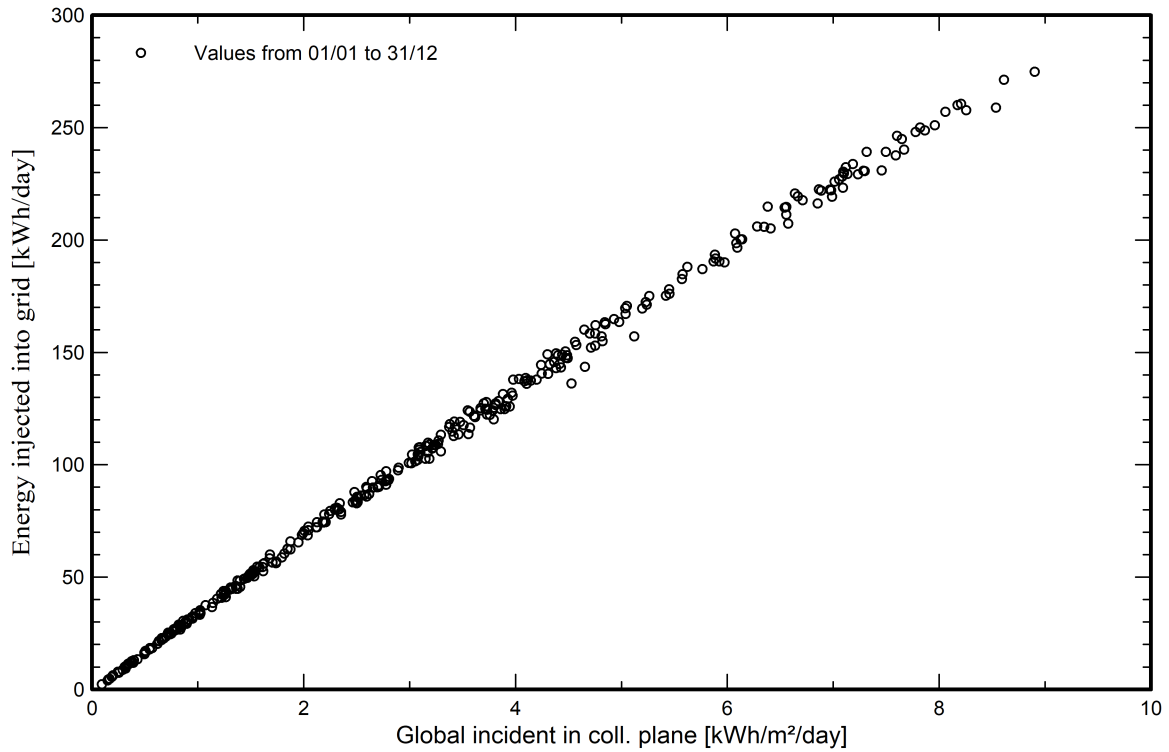
AC ohmic loss

Energy injected into grid



Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

