

PVsyst - Simulation report

Grid-Connected System

Project: Medical College Basti

Variant: New simulation variant

Unlimited sheds

System power: 373 kWp

Khairānti - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
27/11/24 16:08
with V8.0.2

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Project summary

Geographical Site

Khairānti

India

Situation

Latitude 26.77 °N

Longitude 82.80 °E

Altitude 77 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Khairānti

Meteonorm 8.2 (1996-2015), Sat=100% - Synthetic

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth 8 °

Unlimited sheds

Orientation #2

Sheds

Tilt 10 °

Azimuth 29 °

Near Shadings

Mutual shadings of sheds

System information

PV Array

Nb. of modules

643 units

Pnom total

373 kWp

Inverters

Nb. of units

5 units

Pnom total

320 kWac

Pnom ratio

1.165

User's needs

Unlimited load (grid)

Results summary

Produced Energy 528792 kWh/year Specific production 1418 kWh/kWp/year Perf. Ratio PR 91.47 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt	10 °
Azimuth	8 °

Orientation #2

Sheds

Tilt	10 °
Azimuth	29 °

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Bifacial system definition

Orientation #1

Bifacial system

Model	Unlimited Sheds 2D Model
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Bifacial model geometry

Sheds spacing	7.00 m
Sheds width	3.04 m
Limit profile angle	7.4 °
GCR	43.4 %
Height above ground	0.50 m
Nb. of sheds	5 units

Bifacial model definitions

Ground albedo	0.30
Bifaciality factor	80 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

User's needs

Unlimited load (grid)

Unlimited sheds

Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	7.4 °

Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	7.4 °

Horizon

Free Horizon

Sizes

Sheds spacing	7.00 m
Collector width	3.00 m
Average GCR	42.9 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Sizes

Sheds spacing	7.00 m
Collector width	3.00 m
Average GCR	42.9 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Near Shadings

Mutual shadings of sheds

Orientation #2

Bifacial system

Model	Unlimited Sheds 2D Model
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Bifacial model geometry

Sheds spacing	7.00 m
Sheds width	3.04 m
Limit profile angle	7.4 °
GCR	43.4 %
Height above ground	0.50 m
Nb. of sheds	5 units

Bifacial model definitions

Ground albedo	0.30
Bifaciality factor	80 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

PV Array Characteristics

Array #1 - PV Array

Orientation	#1
Tilt/Azimuth	10/8 °



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PV Array Characteristics

PV module

Manufacture Panasonic Life Solutions India Pvt. Ltd

Model AE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 150 units
Nominal (STC) 87.0 kWp
Modules 10 string x 15 In series

At operating cond. (50°C)

Pmpp 80.7 kWp
U mpp 616 V
I mpp 131 A

Array #2 - Sub-array #2

Orientation #2

Tilt/Azimuth 10/29 °

PV module

Manufacture Panasonic Life Solutions India Pvt. Ltd

Model AE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 493 units
Nominal (STC) 286 kWp
Modules 29 string x 17 In series

At operating cond. (50°C)

Pmpp 265 kWp
U mpp 698 V
I mpp 380 A

Total PV power

Nominal (STC) 373 kWp
Total 643 modules
Module area 1660 m²

Inverter

Manufacturer

Growatt New Energy

Model

MID 40KTL3-X

(Original PVsyst database)

Unit Nom. Power 40.0 kWac
Number of inverters 2 units
Total power 80.0 kWac

Operating voltage 200-1000 V

Pnom ratio (DC:AC) 1.09

Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 80KTL3 LV

(Original PVsyst database)

Unit Nom. Power 80.0 kWac
Number of inverters 3 units
Total power 240 kWac

Operating voltage 200-1000 V

Pnom ratio (DC:AC) 1.19

Power sharing within this inverter

Total inverter power

Total power 320 kWac
Number of inverters 5 units
Pnom ratio 1.17

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²KUv (wind) 0.0 W/m²K/m/s

Serie Diode Loss

Voltage drop 0.7 V

Loss Fraction 0.1 % at STC

LID - Light Induced Degradation

Loss Fraction 0.3 %

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction 0.5 % at MPP

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.992	0.963	0.917	0.812	0.567	0.000



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DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 77 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 30 mΩ
Loss Fraction 1.5 % at STC

System losses

Unavailability of the system

Time fraction 1.0 %
3.7 days,
3 periods

AC wiring losses

Inv. output line up to injection point

Inverter voltage 400 Vac tri
Loss Fraction 0.10 % at STC

Inverter: MID 40KTL3-X

Wire section (2 Inv.) Alu 2 x 3 x 95 mm²
Average wires length 50 m

Inverter: MAX 80KTL3 LV

Wire section (3 Inv.) Alu 3 x 3 x 70 mm²
Average wires length 0 m

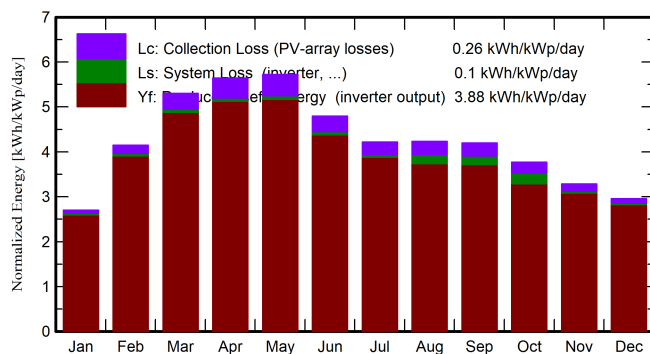


Main results

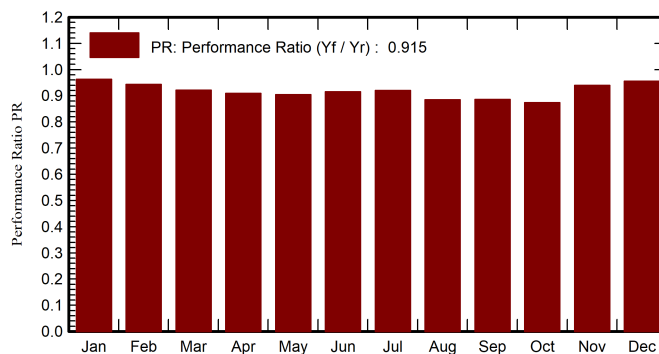
System Production

Produced Energy (P50)	528792 kWh/year	Specific production (P50)	1418 kWh/kWp/year	Perf. Ratio PR	91.47 %
Produced Energy (P90)	491778 kWh/year	Specific production (P90)	1319 kWh/kWp/year		
Produced Energy (P75)	509332 kWh/year	Specific production (P75)	1366 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

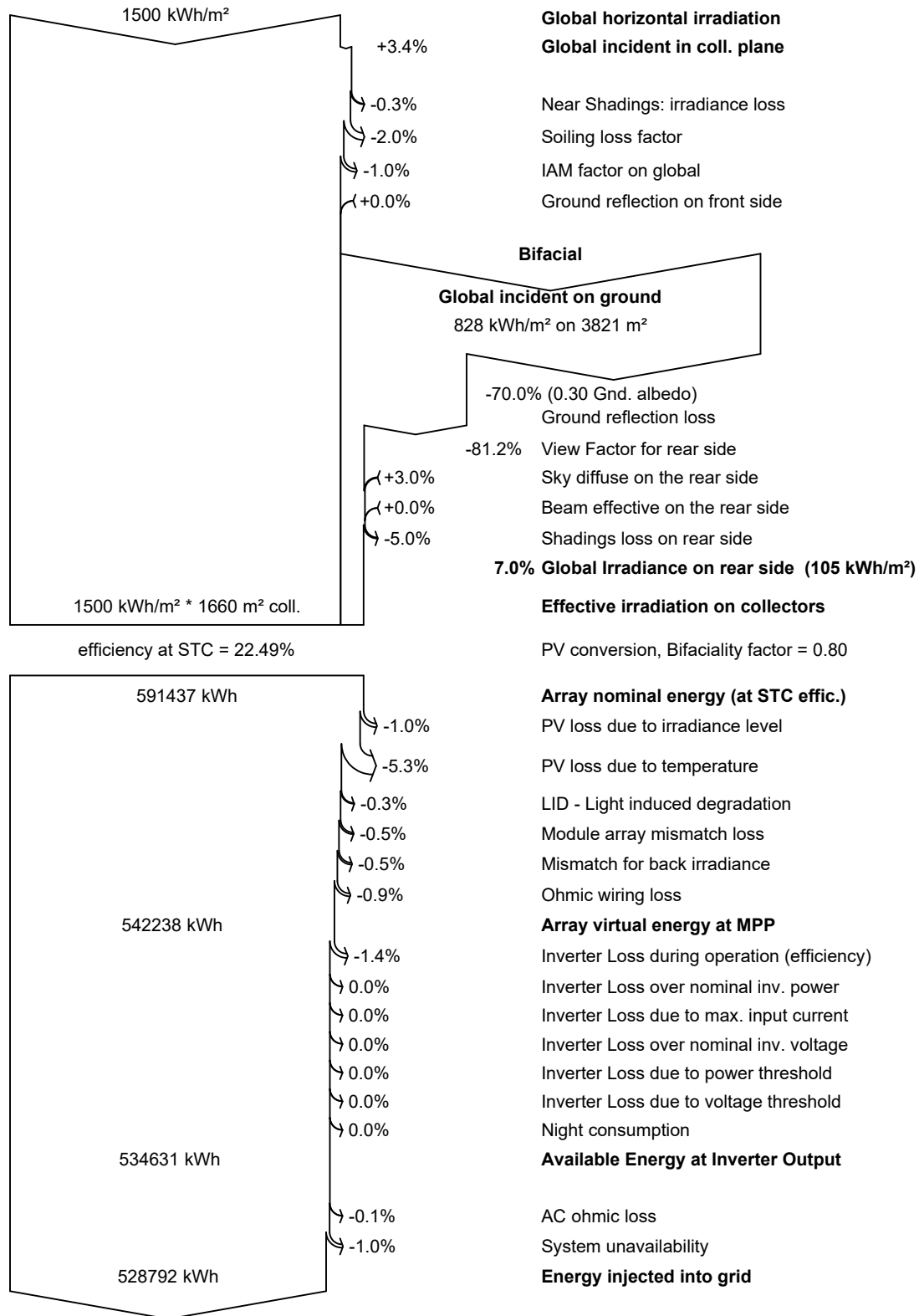
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	76.7	52.22	14.38	83.8	80.9	30528	30071	0.962
February	107.3	59.31	19.18	116.1	112.5	41431	40862	0.944
March	155.4	78.69	24.73	164.4	159.5	57258	56467	0.921
April	166.2	92.16	29.40	169.3	164.1	58214	57427	0.909
May	178.3	96.01	31.08	177.4	172.1	60702	59826	0.904
June	146.0	98.71	30.68	143.9	139.2	49813	49083	0.915
July	132.2	92.14	29.48	130.8	126.5	45577	44904	0.920
August	131.5	88.36	29.31	131.3	126.8	45656	43295	0.884
September	122.4	78.07	28.35	125.9	121.8	43818	41594	0.886
October	110.6	71.04	26.19	116.9	113.1	40903	38061	0.873
November	90.1	56.25	21.00	98.6	95.3	35019	34521	0.939
December	82.9	53.83	16.34	91.7	88.6	33146	32681	0.956
Year	1499.5	916.79	25.03	1550.0	1500.5	542065	528792	0.915

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		



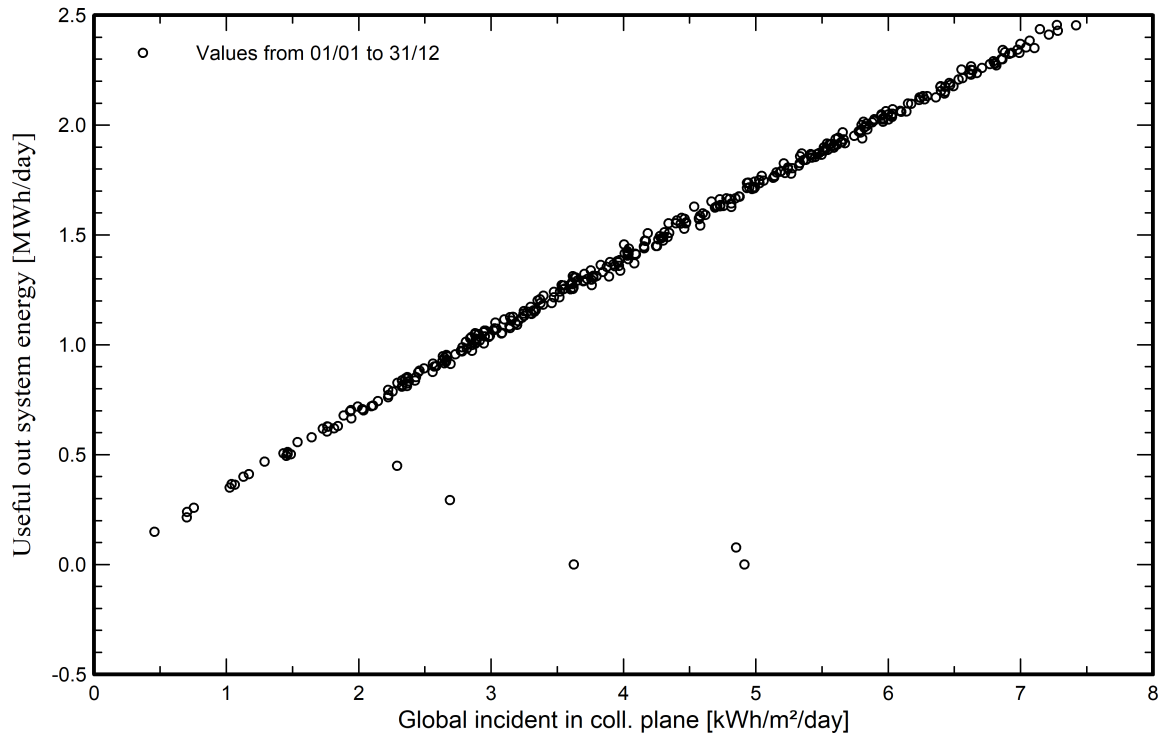
Loss diagram



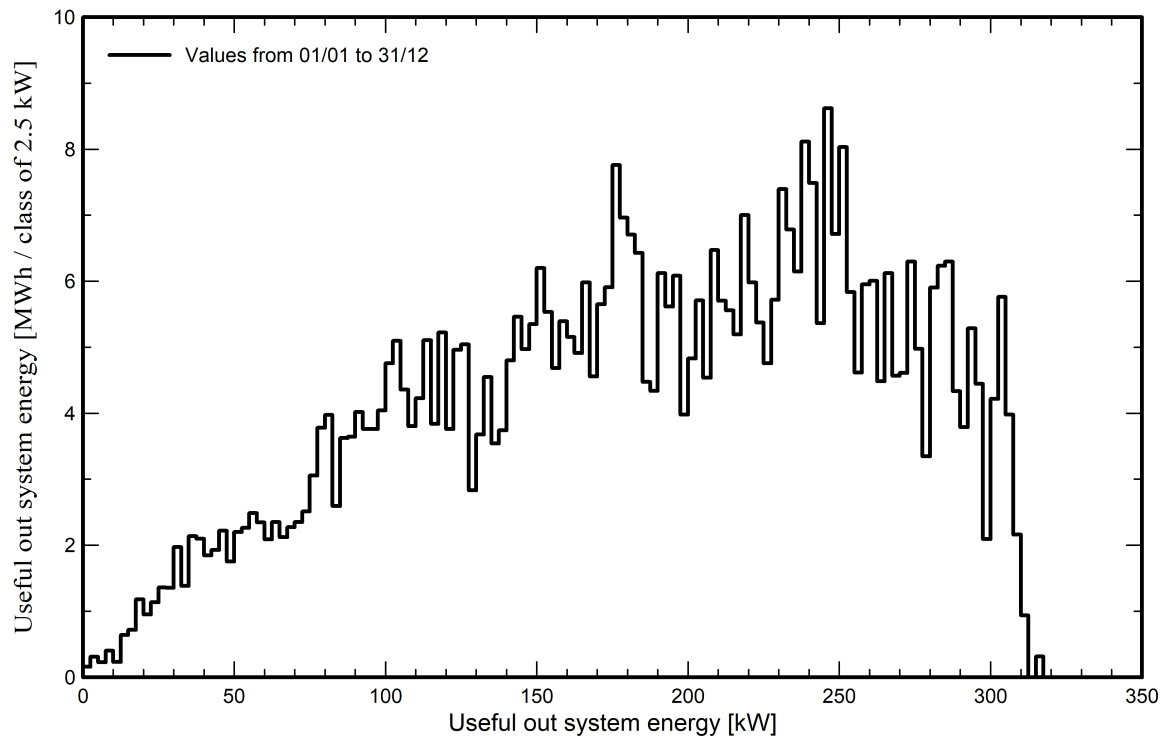


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





P50 - P90 evaluation

Weather data

Source Meteonorm 8.2 (1996-2015), Sat=100%
Kind Monthly averages
Synthetic - Multi-year average
Year-to-year variability(Variance) 5.2 %

Specified Deviation

Climate change 0.0 %

Global variability (weather data + system)

Variability (Quadratic sum) 5.5 %

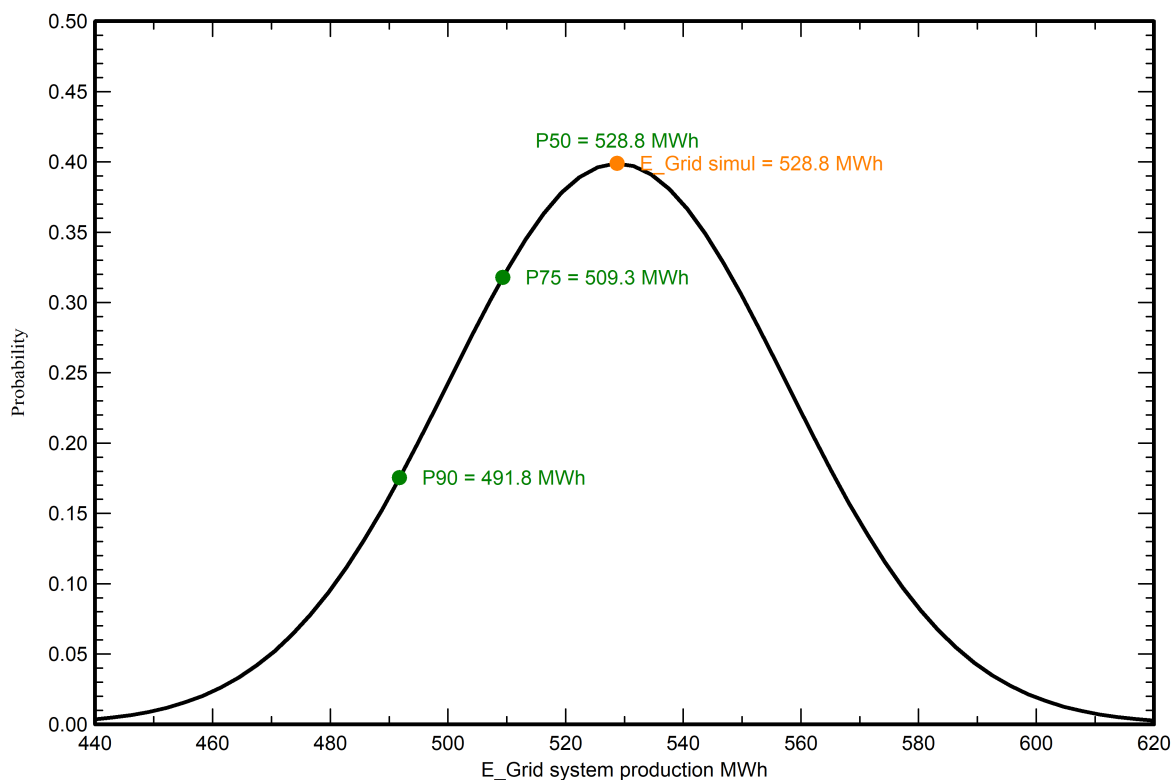
Simulation and parameters uncertainties

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 28.9 MWh
P50 528.8 MWh
P90 491.8 MWh
P75 509.3 MWh

Probability distribution

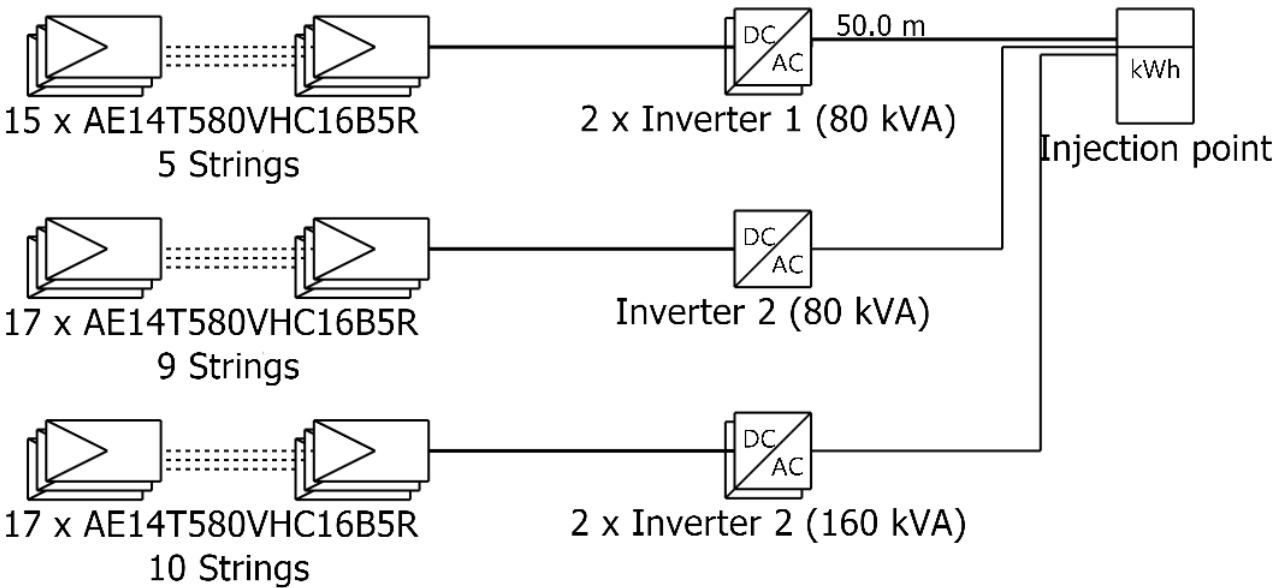




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MID 40KTL3-X
Inverter 2	MAX 80KTL3 LV
String 1	15 x AE14T580VHC16B5R
String 2	17 x AE14T580VHC16B5R

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27/11/24