

PVsyst - Simulation report

Grid-Connected System

Project: Medical Hospital Bahraich

Variant: New simulation variant

Unlimited sheds

System power: 928 kWp

Bhogājot - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
04/12/24 12:19
with V8.0.2

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Project summary

Geographical Site

Bhogājot

India

Situation

Latitude 27.57 °N

Longitude 81.59 °E

Altitude 108 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Bhogājot

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

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth 44 °

Unlimited sheds

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

1600 units

Pnom total

928 kWp

Inverters

Nb. of units

11 units

Pnom total

810 kWac

Pnom ratio

1.146

Results summary

Produced Energy 1337533 kWh/year Specific production 1441 kWh/kWp/year Perf. Ratio PR 91.64 %

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General parameters

Grid-Connected System

Unlimited sheds

Orientation #1

Sheds

Tilt	10 °
Azimuth	44 °

Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	11.7 °

Sizes

Sheds spacing	5.50 m
Collector width	3.00 m
Average GCR	54.5 %
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

Mutual shadings of sheds

Bifacial system definition

Orientation #1

Bifacial system

Model	Unlimited Sheds 2D Model
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Bifacial model geometry

Sheds spacing	5.50 m
Sheds width	3.04 m
Limit profile angle	11.7 °
GCR	55.3 %
Height above ground	1.50 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)

PV Array Characteristics

Array #1 - PV Array

PV module

Manufacturer	Panasonic Life Solutions India Pvt. Ltd
Model	AE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power	580 Wp
Number of PV modules	480 units
Nominal (STC)	278 kWp
Modules	30 string x 16 In series

At operating cond. (50°C)

Pmpp	258 kWp
U mpp	657 V
I mpp	393 A

Inverter

Manufacturer	Growatt New Energy
Model	MAC 50KTL3-X LV

(Custom parameters definition)

Unit Nom. Power	50.0 kWac
Number of inverters	5 units
Total power	250 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.11
Power sharing within this inverter	



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PV Array Characteristics

Array #2 - Sub-array #2

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 288 units
Nominal (STC) 167 kWp
Modules 18 string x 16 In series

At operating cond. (50°C)

Pmpp 155 kWp
U mpp 657 V
I mpp 236 A

Array #3 - Sub-array #3

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 832 units
Nominal (STC) 483 kWp
Modules 52 string x 16 In series

At operating cond. (50°C)

Pmpp 447 kWp
U mpp 657 V
I mpp 681 A

Total PV power

Nominal (STC) 928 kWp
Total 1600 modules
Module area 4130 m²

Inverter

Manufacturer Growatt New Energy
Model MAX 80KTL3 LV
(Original PVsyst database)

Unit Nom. Power 80.0 kWac
Number of inverters 2 units
Total power 160 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.04
Power sharing within this inverter

Inverter

Manufacturer Growatt New Energy
Model MAX 100KTL3-X LV
(Original PVsyst database)

Unit Nom. Power 100 kWac
Number of inverters 4 units
Total power 400 kWac
Operating voltage 180-1000 V
Pnom ratio (DC:AC) 1.21
Power sharing within this inverter

Total inverter power

Total power 810 kWac
Number of inverters 11 units
Pnom ratio 1.15

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (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

Array #1 - PV Array

Loss Fraction 1.0 % at MPP

Array #2 - Sub-array #2

Loss Fraction 1.0 % at MPP

Array #3 - Sub-array #3

Loss Fraction 1.0 % 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 8.2 mΩ

Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 27 mΩ

Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 16 mΩ

Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 45 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 0.23 % at STC

Inverter: MAC 50KTL3-X LV

Wire section (5 Inv.) Alu 5 x 3 x 70 mm²

Average wires length 50 m

Inverter: MAX 100KTL3-X LV

Wire section (4 Inv.) Alu 4 x 3 x 95 mm²

Average wires length 0 m

Inverter: MAX 80KTL3 LV

Wire section (2 Inv.) Alu 2 x 3 x 50 mm²

Average wires length 0 m



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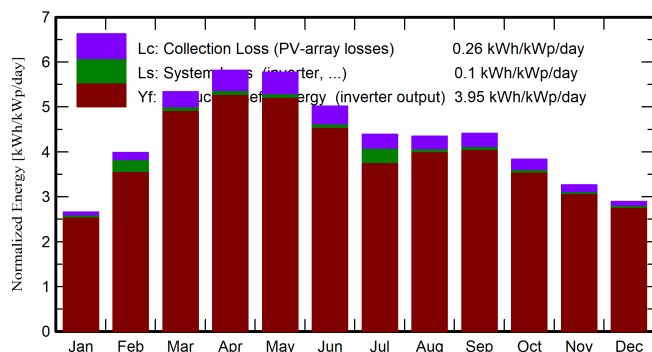
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Main results

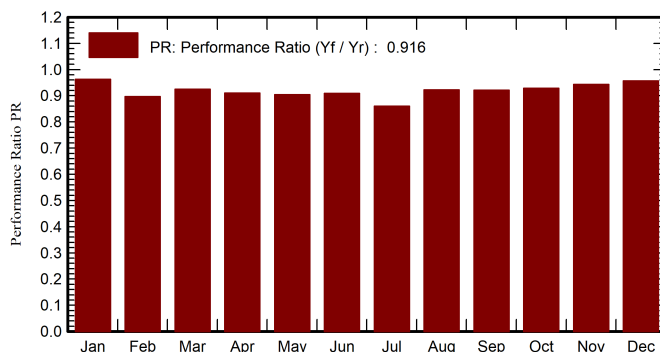
System Production

Produced Energy (P50)	1337533 kWh/year	Specific production (P50)	1441 kWh/kWp/year	Perf. Ratio PR	91.64 %
Produced Energy (P90)	1306614 kWh/year	Specific production (P90)	1408 kWh/kWp/year		
Produced Energy (P75)	1321277 kWh/year	Specific production (P75)	1424 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

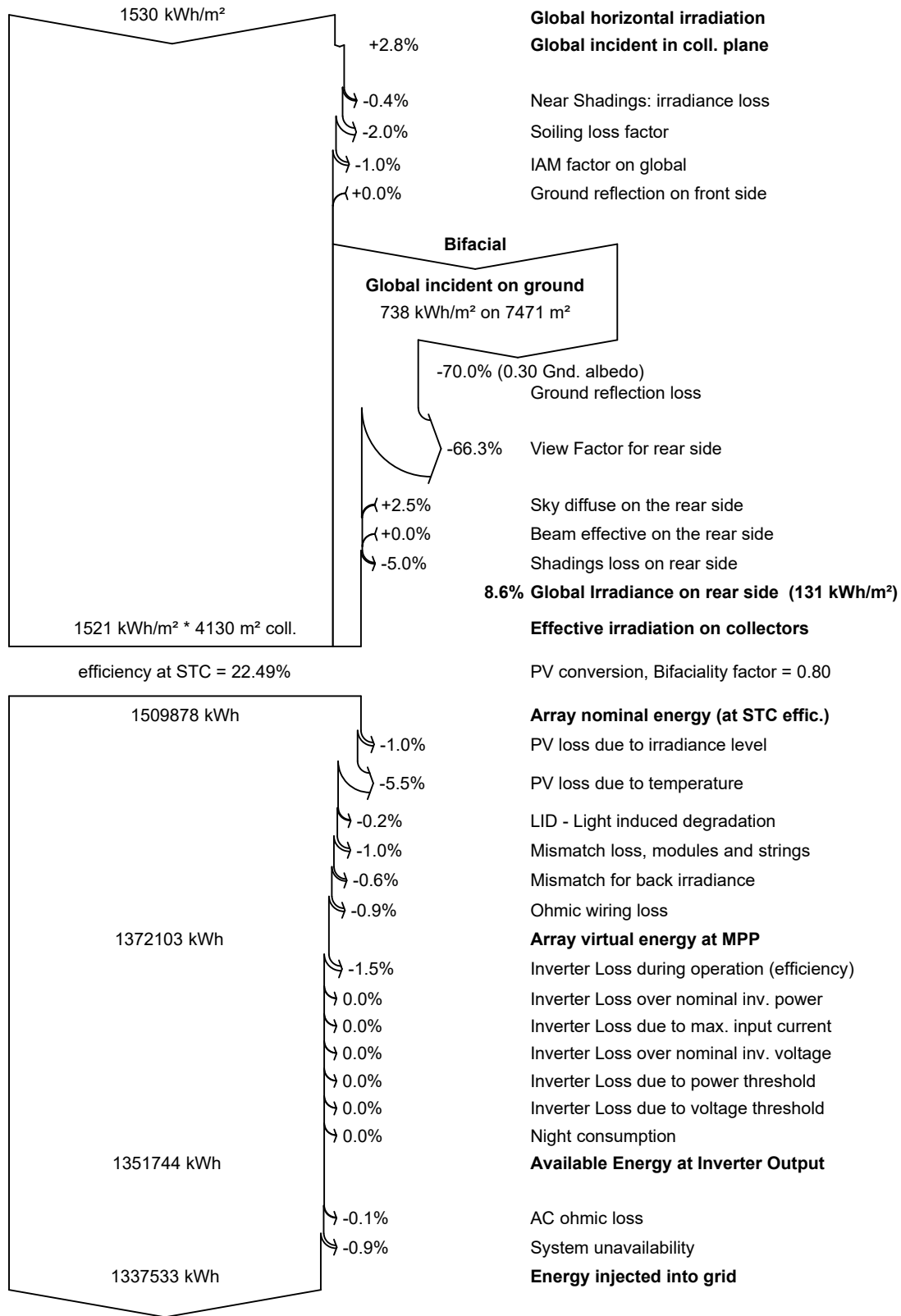
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	76.7	50.3	14.20	82.4	79.4	74864	73617	0.963
February	104.5	58.4	18.53	111.5	107.8	99735	92796	0.897
March	158.1	76.9	24.24	165.4	160.2	144131	141908	0.925
April	171.9	90.6	29.83	174.4	169.1	149551	147285	0.910
May	179.6	102.4	32.44	179.0	173.4	152564	150195	0.904
June	151.7	95.7	31.92	150.4	145.6	128942	126839	0.909
July	137.3	88.9	29.97	136.0	131.5	117744	108567	0.860
August	134.7	89.7	29.44	134.8	130.2	117278	115432	0.922
September	129.5	74.5	28.46	132.3	127.9	114934	113110	0.921
October	112.9	72.1	26.25	118.8	114.8	104011	102369	0.929
November	91.1	58.2	20.62	97.9	94.4	87009	85661	0.943
December	82.1	51.9	15.81	89.8	86.4	81027	79755	0.957
Year	1530.2	909.5	25.17	1572.8	1520.6	1371790	1337533	0.916

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		



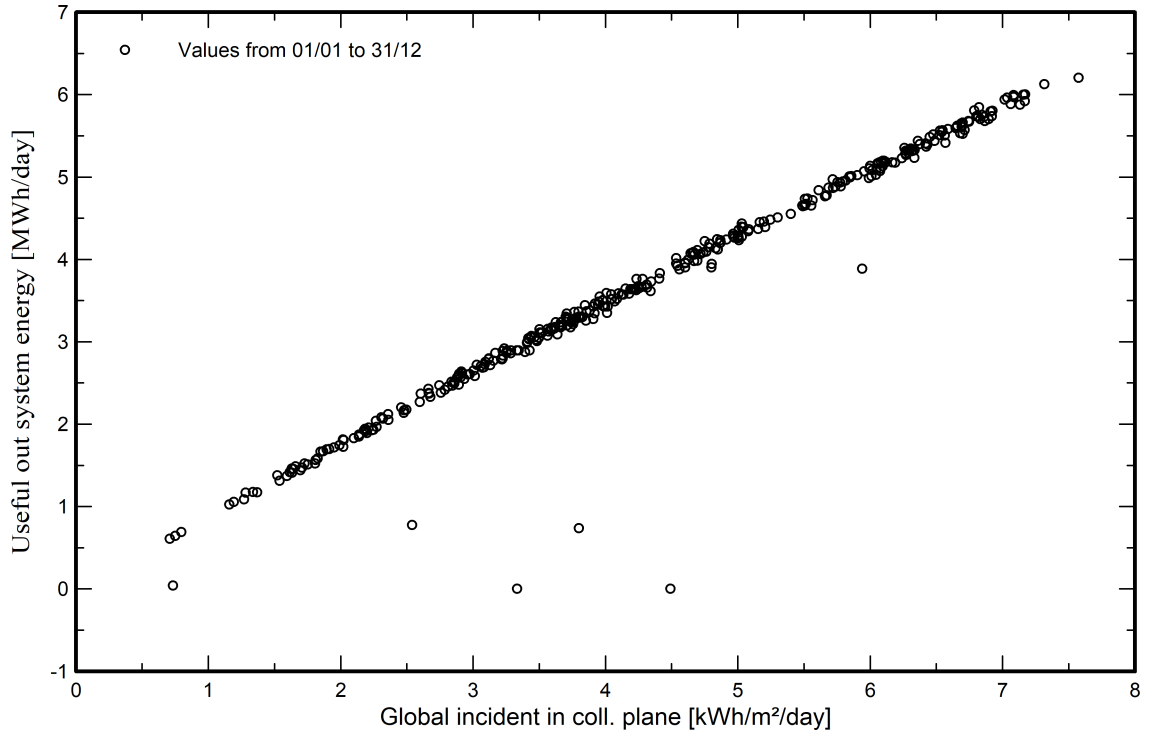
Loss diagram



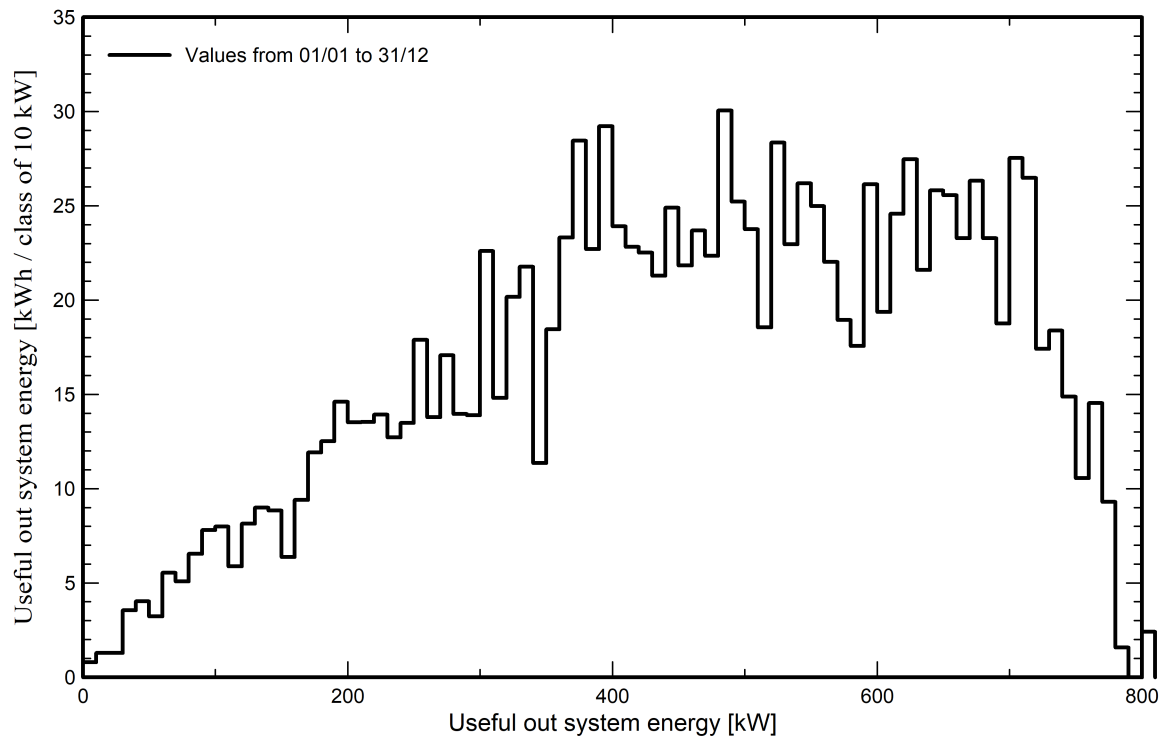


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





P50 - P90 evaluation

Weather data

Source Meteonorm 8.2 (1996-2015), Sat=100%
Kind Not defined
Year-to-year variability(Variance) 0.0 %

Specified Deviation

Global variability (weather data + system)

Variability (Quadratic sum) 1.8 %

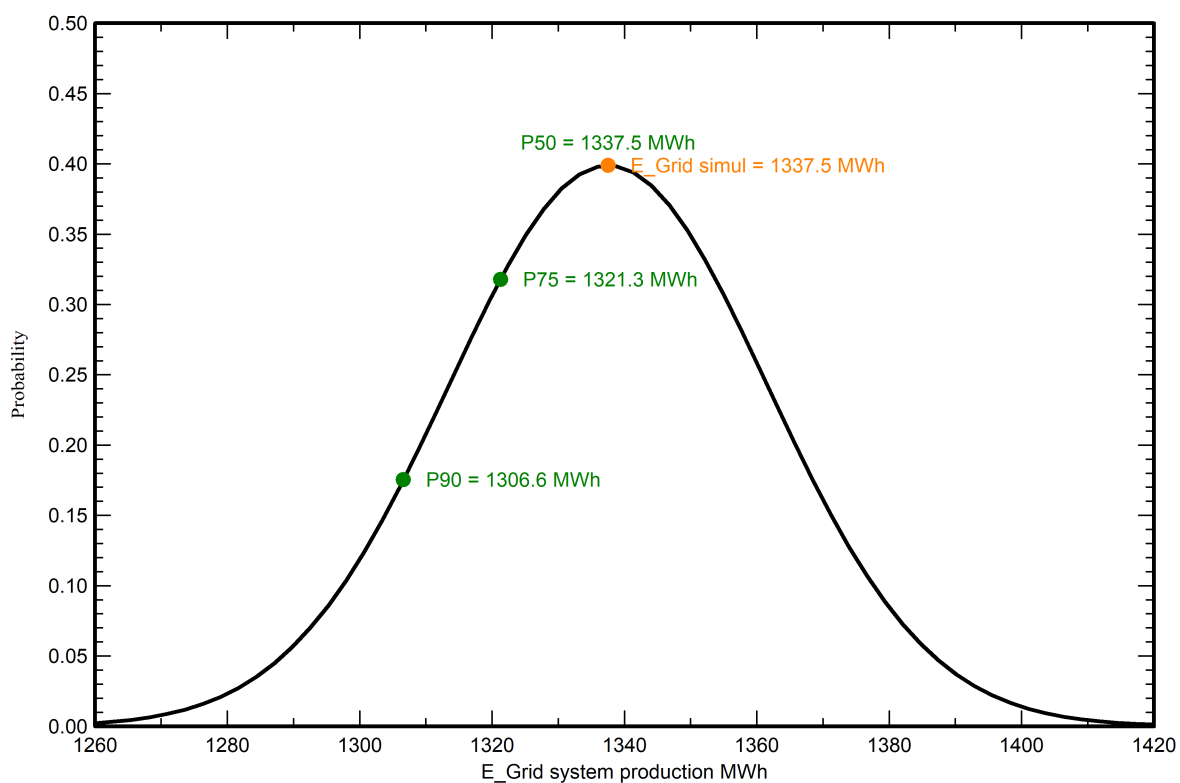
Simulation and parameters uncertainties

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 24.1 MWh
P50 1337.5 MWh
P90 1306.6 MWh
P75 1321.3 MWh

Probability distribution

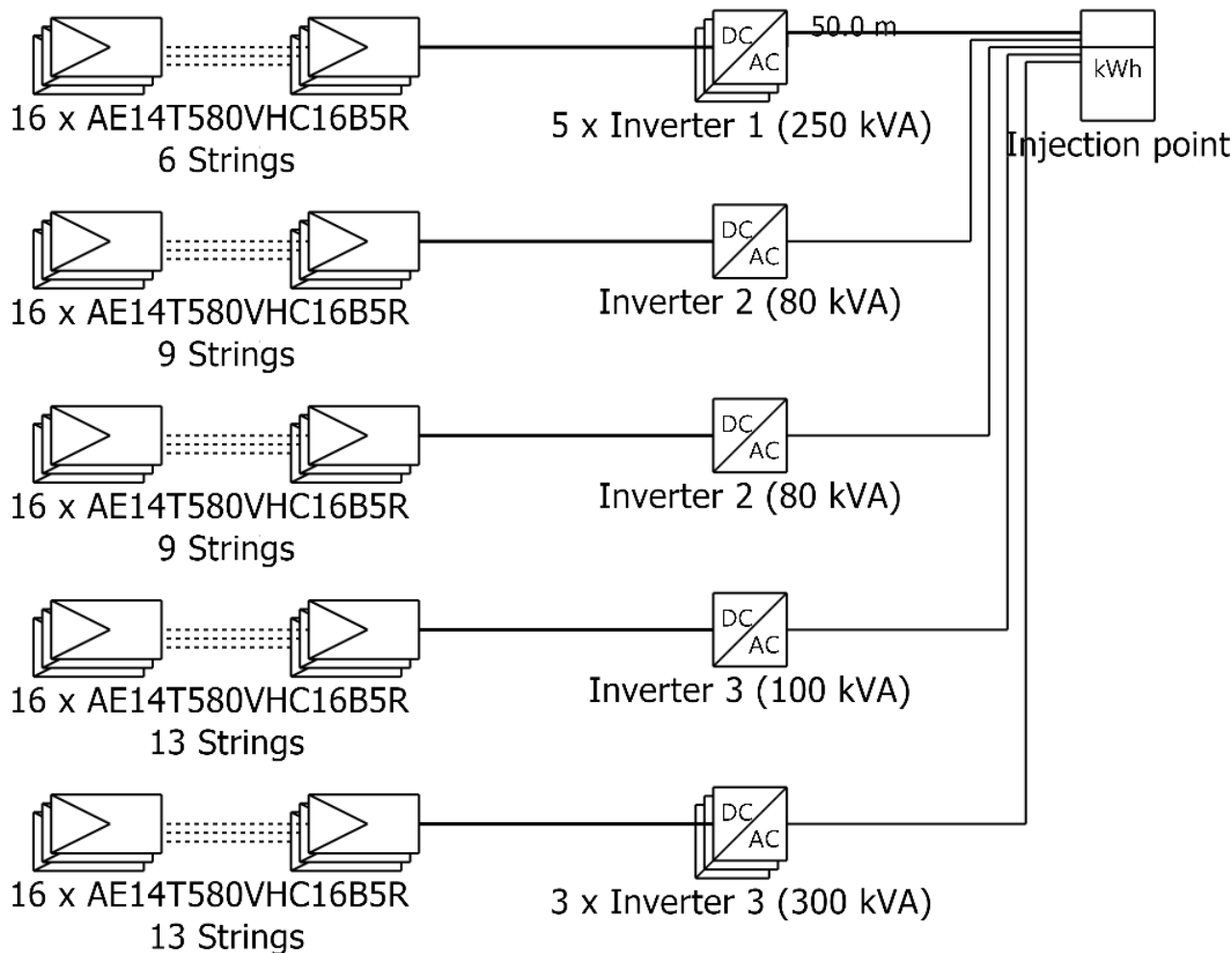




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MAC 50KTL3-X LV
Inverter 2	MAX 80KTL3 LV
Inverter 3	MAX 100KTL3-X LV
String	16 x AE14T580VHC16B5R

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