

PVsyst - Simulation report

Grid-Connected System

Project: DeenDayal Hospital Moradabad

Variant: New simulation variant

Unlimited sheds

System power: 746 kWp

Banglagaon - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
27/11/24 17:09
with V8.0.2

Jakson Limited (India)

Project summary

Geographical Site

Banglagaan

India

Situation

Latitude 28.85 °N

Longitude 78.77 °E

Altitude 213 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Banglagaan

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

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth 21 °

Unlimited sheds

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

1287 units

Pnom total

746 kWp

Inverters

Nb. of units

10 units

Pnom total

610 kWac

Pnom ratio

1.224

Results summary

Produced Energy 1138037 kWh/year Specific production 1525 kWh/kWp/year Perf. Ratio PR 94.46 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt	10 °
Azimuth	21 °

Unlimited sheds

Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	8.7 °

Sizes

Sheds spacing	6.40 m
Collector width	3.00 m
Average GCR	46.9 %
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	6.40 m
Sheds width	3.04 m
Limit profile angle	8.7 °
GCR	47.5 %
Height above ground	2.00 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	255 units
Nominal (STC)	148 kWp
Modules	17 string x 15 In series

At operating cond. (50°C)

Pmpp	137 kWp
U mpp	616 V
I mpp	223 A

Inverter

Manufacturer	Growatt New Energy
Model	MID 40KTL3-X
(Original PVsyst database)	
Unit Nom. Power	40.0 kWac
Number of inverters	3 units
Total power	120 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.23
Power sharing within this inverter	



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PV Array Characteristics

Array #2 - Sub-array #2

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules315 units
Nominal (STC)183 kWp
Modules21 string x 15 In series

At operating cond. (50°C)

Pmpp169 kWp
U mpp616 V
I mpp275 A

Array #3 - Sub-array #3

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules496 units
Nominal (STC)288 kWp
Modules31 string x 16 In series

At operating cond. (50°C)

Pmpp267 kWp
U mpp657 V
I mpp406 A

Array #4 - Sub-array #4

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules221 units
Nominal (STC)128 kWp
Modules13 string x 17 In series

At operating cond. (50°C)

Pmpp119 kWp
U mpp698 V
I mpp170 A

Total PV power

Nominal (STC)746 kWp
Total1287 modules
Module area3322 m²

Inverter

Manufacturer

Growatt New Energy

Model

MAC 50KTL3-X LV

(Custom parameters definition)

Unit Nom. Power50.0 kWac
Number of inverters3 units
Total power150 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.22
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 80KTL3 LV

(Original PVsyst database)

Unit Nom. Power80.0 kWac
Number of inverters3 units
Total power240 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.20
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 100KTL3-X LV

(Original PVsyst database)

Unit Nom. Power100 kWac
Number of inverters1 unit
Total power100 kWac
Operating voltage180-1000 V
Pnom ratio (DC:AC)1.28
Power sharing within this inverter

Total inverter power

Total power610 kWac
Number of inverters10 units
Pnom ratio1.22



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

Array #1 - PV Array

Loss Fraction 0.5 % at MPP

Array #2 - Sub-array #2

Loss Fraction 0.5 % at MPP

Array #3 - Sub-array #3

Loss Fraction 0.5 % at MPP

Array #4 - Sub-array #4

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

DC wiring losses

Global wiring resistance 9.8 mΩ

Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 45 mΩ

Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 36 mΩ

Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 26 mΩ

Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 67 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 0.11 % at STC

Inverters: MID 40KTL3-X, MAX 80KTL3 LV

Wire section (6 Inv.) Alu 6 x 3 x 70 mm²

Average wires length 20 m

Inverter: MAC 50KTL3-X LV

Wire section (3 Inv.) Alu 3 x 3 x 35 mm²

Average wires length 0 m

Inverter: MAX 100KTL3-X LV

Wire section (1 Inv.) Alu 1 x 3 x 120 mm²

Wires length 0 m



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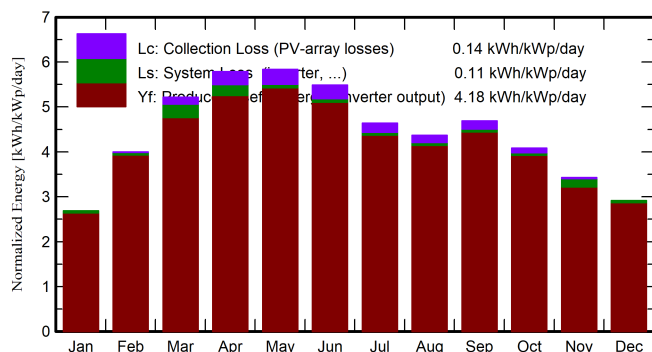
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Main results

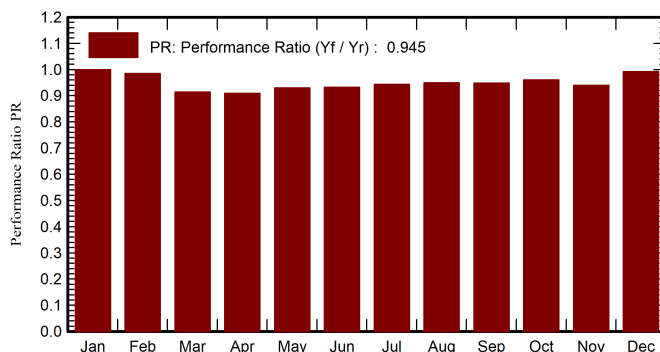
System Production

Produced Energy (P50)	1138037 kWh/year	Specific production (P50)	1525 kWh/kWp/year	Perf. Ratio PR	94.46 %
Produced Energy (P90)	1111730 kWh/year	Specific production (P90)	1489 kWh/kWp/year		
Produced Energy (P75)	1124206 kWh/year	Specific production (P75)	1506 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

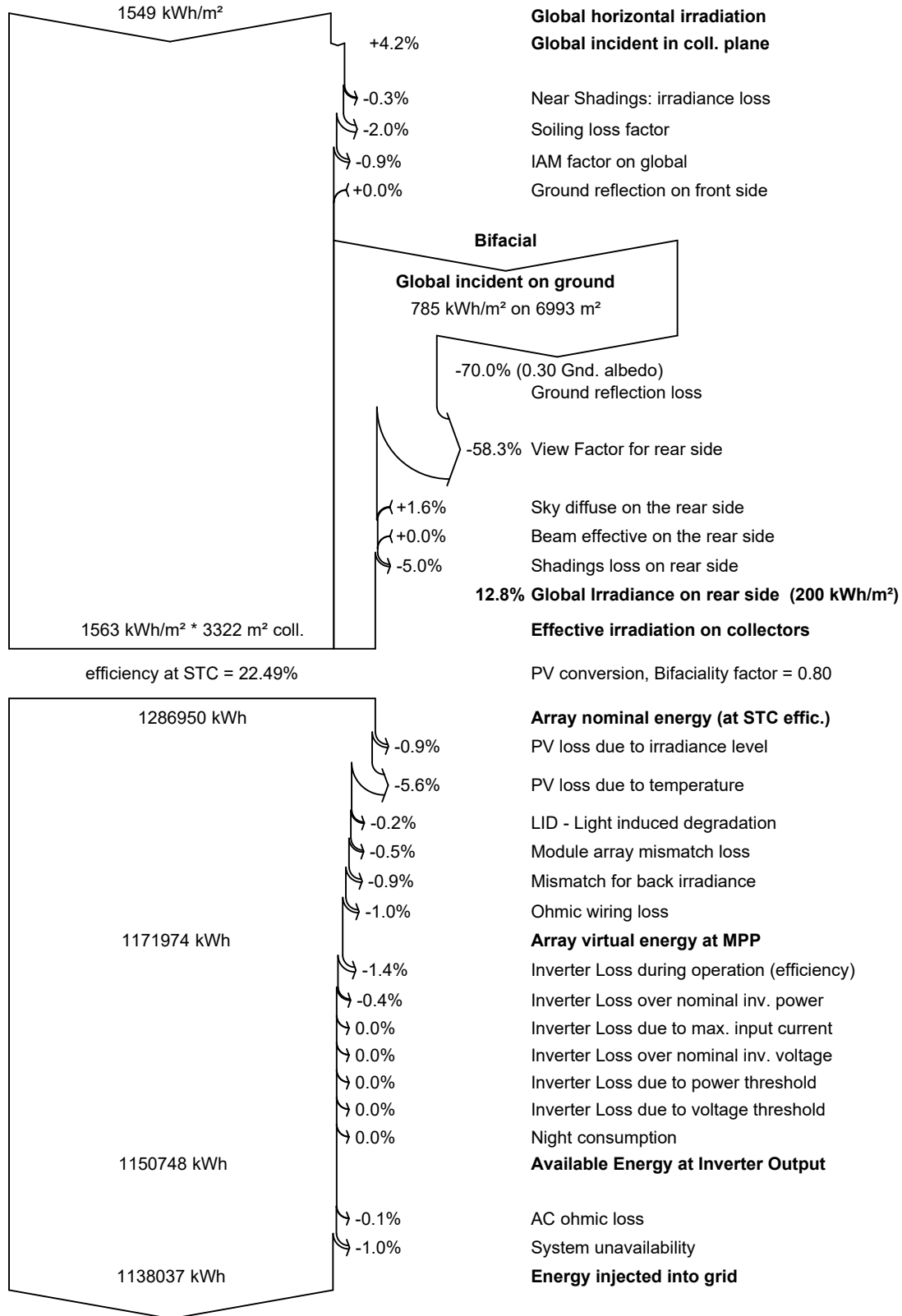
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	74.3	46.4	13.37	82.1	79.3	62243	61278	1.000
February	102.4	54.9	17.53	111.9	108.4	83490	82277	0.985
March	152.1	72.3	23.67	161.7	156.8	117203	110322	0.914
April	169.8	88.2	29.61	173.6	168.3	123250	117785	0.909
May	180.5	103.0	33.55	180.9	175.4	127470	125621	0.930
June	166.0	100.5	33.11	164.5	159.3	116221	114504	0.932
July	144.9	97.0	31.44	143.8	139.0	102813	101298	0.944
August	134.6	87.8	30.41	135.4	131.0	97432	95959	0.949
September	134.7	75.7	29.11	140.7	136.3	101053	99553	0.948
October	118.3	71.9	26.53	126.7	122.7	92213	90878	0.961
November	92.4	54.8	20.21	102.9	99.5	76341	72144	0.939
December	79.0	47.3	14.95	89.6	86.7	67467	66420	0.993
Year	1548.9	899.7	25.32	1613.9	1562.7	1167196	1138037	0.945

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		



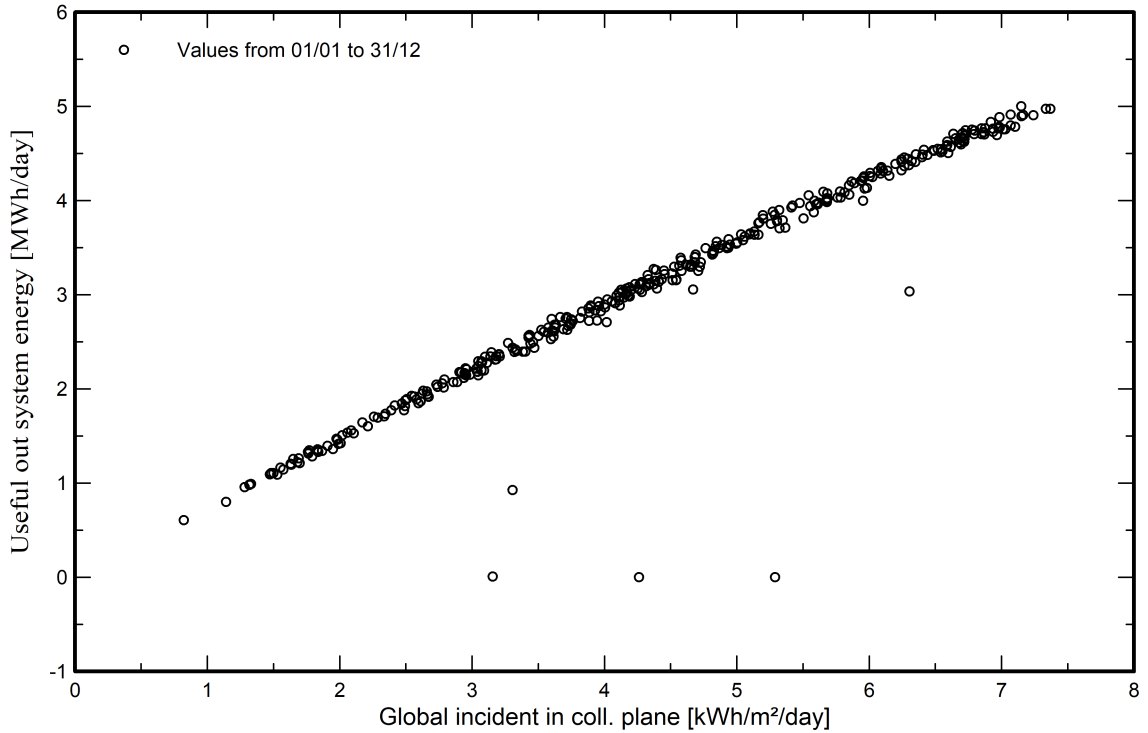
Loss diagram



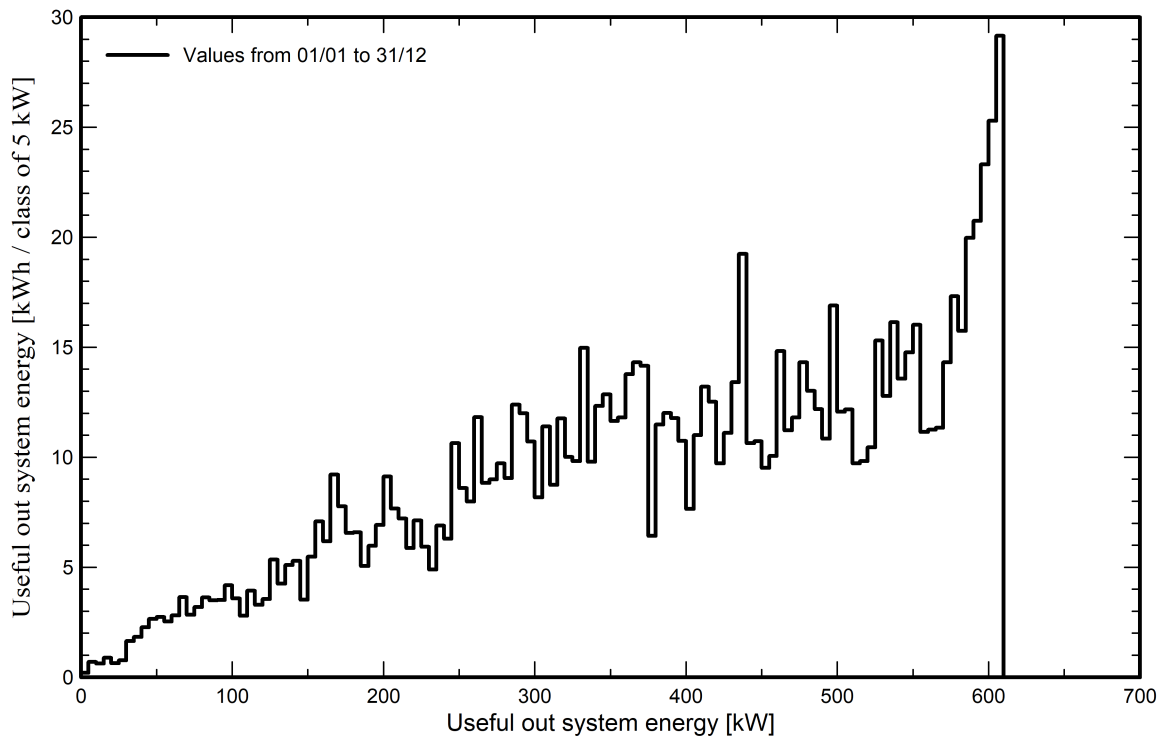


Predef. graphs

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 %

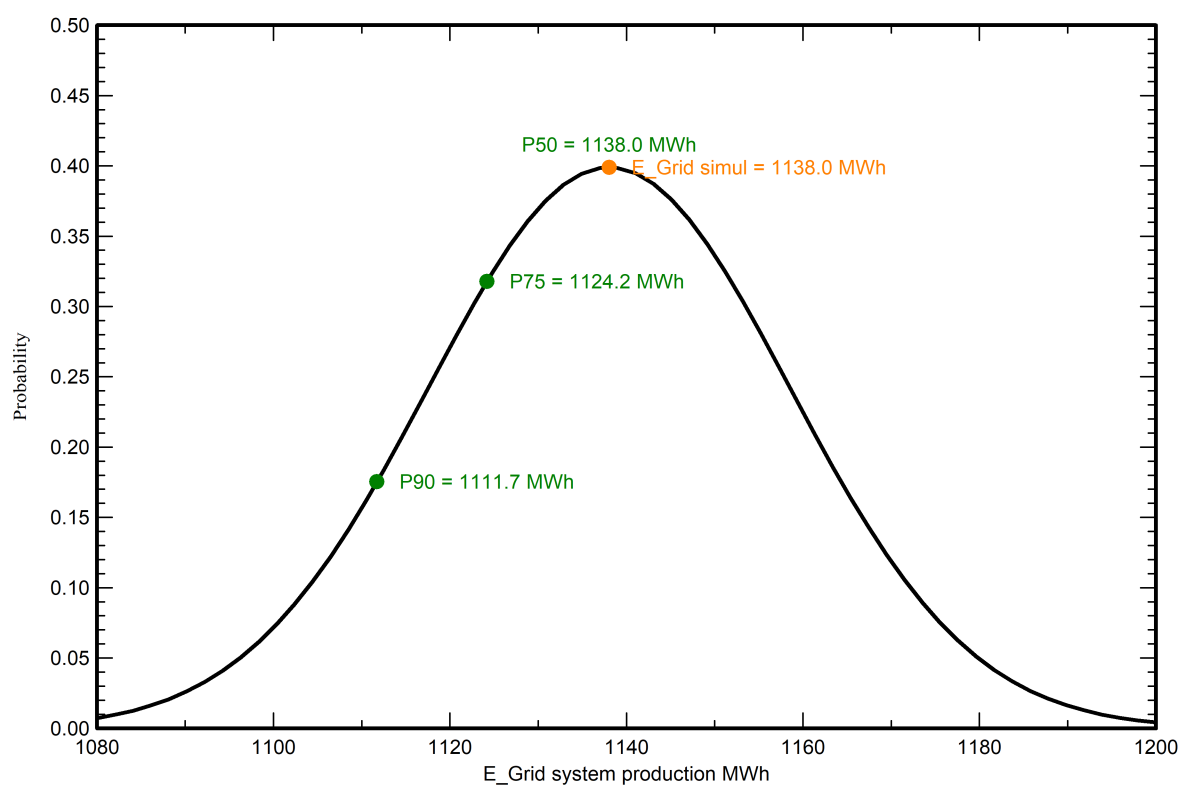
Simulation and parameters uncertainties

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 20.5 MWh
P50 1138.0 MWh
P90 1111.7 MWh
P75 1124.2 MWh

Probability distribution

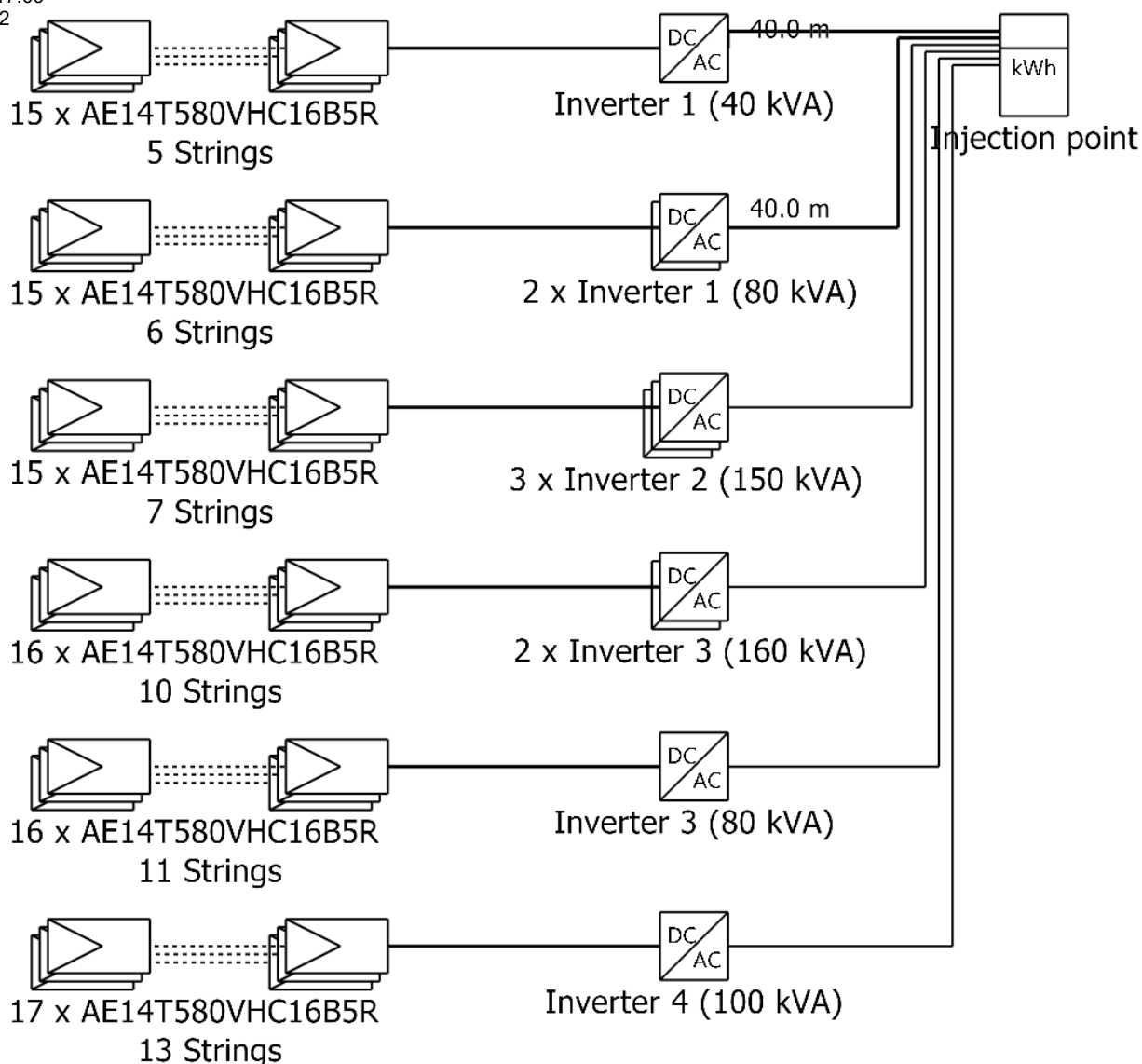




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MID 40KTL3-X
Inverter 2	MAC 50KTL3-X LV
Inverter 3	MAX 80KTL3 LV
Inverter 4	MAX 100KTL3-X LV
String 1	15 x AE14T580VHC16B5R
String 2	16 x AE14T580VHC16B5R
String 3	17 x AE14T580VHC16B5R

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