

PVsyst - Simulation report

Grid-Connected System

Project: Tej Prayagraj hospital

Variant: New simulation variant

Unlimited sheds

System power: 452 kWp

Beli - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
04/12/24 12:37
with V8.0.2

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Project summary

Geographical Site

Beli
India

Situation

Latitude 25.47 °N
Longitude 81.85 °E
Altitude 104 m
Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

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

System summary

Grid-Connected System

Orientation #1 Sheds

Tilt 10 °
Azimuth 0 °

Unlimited sheds

Orientation #2 Sheds

Tilt 10 °
Azimuth 32 °

Near Shadings

Mutual shadings of sheds

System information

PV Array

Nb. of modules 780 units
Pnom total 452 kWp

Inverters

Nb. of units 5 units
Pnom total 380 kWac
Pnom ratio 1.191

User's needs

Unlimited load (grid)

Results summary

Produced Energy 638461 kWh/year Specific production 1411 kWh/kWp/year Perf. Ratio PR 87.16 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt	10 °
Azimuth	0 °

Orientation #2

Sheds

Tilt	10 °
Azimuth	32 °

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	6.20 m
Sheds width	3.04 m
Limit profile angle	9.2 °
GCR	49.0 %
Height above ground	1.50 m
Nb. of sheds	10 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 %

Unlimited sheds

Sheds configuration

Nb. of sheds	10 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	9.2 °

Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	9.2 °

Horizon

Free Horizon

Sizes

Sheds spacing	6.20 m
Collector width	3.00 m
Average GCR	48.4 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Sizes

Sheds spacing	6.20 m
Collector width	3.00 m
Average GCR	48.4 %
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Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

PV Array Characteristics

Array #1 - PV Array

Orientation	#1
Tilt/Azimuth	10/0 °



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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 130 units
Nominal (STC) 75.4 kWp
Modules 10 string x 13 In series
At operating cond. (50°C)
Pmpp 69.9 kWp
U mpp 534 V
I mpp 131 A

Array #2 - Sub-array #2

Orientation #2
Tilt/Azimuth 10/32 °

PV module

Manufacture 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 16 string x 18 In series
At operating cond. (50°C)
Pmpp 155 kWp
U mpp 739 V
I mpp 210 A

Array #3 - Sub-array #3

Orientation #2
Tilt/Azimuth 10/32 °

PV module

Manufacture Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)
Unit Nom. Power 580 Wp
Number of PV modules 170 units
Nominal (STC) 98.6 kWp
Modules 10 string x 17 In series
At operating cond. (50°C)
Pmpp 91.4 kWp
U mpp 698 V
I mpp 131 A

Array #4 - Sub-array #4

Orientation #2
Tilt/Azimuth 10/32 °

Inverter

Manufacturer Growatt New Energy
Model MAX 60KTL3 LV
(Original PVsyst database)
Unit Nom. Power 60.0 kWac
Number of inverters 1 unit
Total power 60.0 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.26
Power sharing within this inverter

Inverter

Manufacturer Growatt New Energy
Model MAX 70KTL3 MV
(Original PVsyst database)
Unit Nom. Power 70.0 kWac
Number of inverters 2 units
Total power 140 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.19
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 1 unit
Total power 80.0 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.23
Power sharing within this inverter



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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 192 units
Nominal (STC) 111 kWp
Modules 12 string x 16 In series

At operating cond. (50°C)

Pmpp 103 kWp
U mpp 657 V
I mpp 157 A

Total PV power

Nominal (STC) 452 kWp
Total 780 modules
Module area 2013 m²

Inverter

Manufacturer

Growatt New Energy

Model

MAX 100KTL3-X LV

(Original PVsyst database)

Unit Nom. Power 100 kWac
Number of inverters 1 unit
Total power 100 kWac
Operating voltage 180-1000 V
Pnom ratio (DC:AC) 1.11
Power sharing within this inverter

Total inverter power

Total power 380 kWac
Number of inverters 5 units
Pnom ratio 1.19

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 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

Array #4 - Sub-array #4

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

DC wiring losses

Global wiring resistance 10 mΩ

Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 66 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 87 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 57 mΩ
Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 68 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

Inverters: MAX 60KTL3 LV, MAX 80KTL3 LV

Wire section (2 Inv.) Alu 2 x 3 x 70 mm²
Average wires length 15 m

Inverter: MAX 100KTL3-X LV

Wire section (1 Inv.) Alu 1 x 3 x 95 mm²
Wires length 0 m

Inverter: MAX 70KTL3 MV

Wire section (2 Inv.) Alu 2 x 3 x 50 mm²
Average wires length 0 m

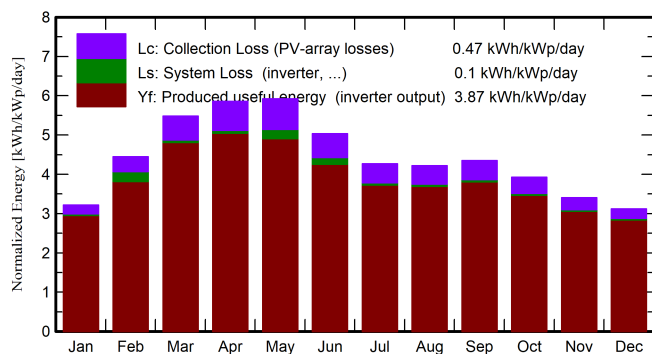


Main results

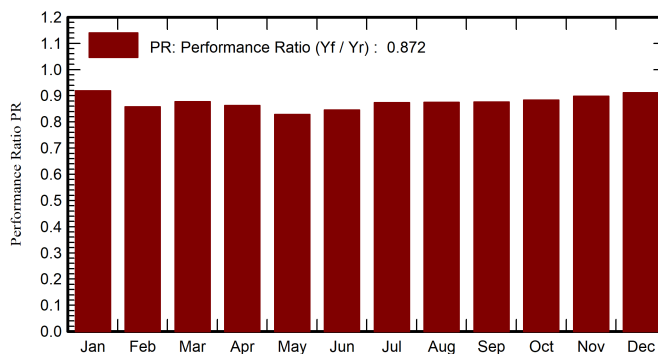
System Production

Produced Energy (P50)	638461 kWh/year	Specific production (P50)	1411 kWh/kWp/year	Perf. Ratio PR	87.16 %
Produced Energy (P90)	623702 kWh/year	Specific production (P90)	1379 kWh/kWp/year		
Produced Energy (P75)	630701 kWh/year	Specific production (P75)	1394 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

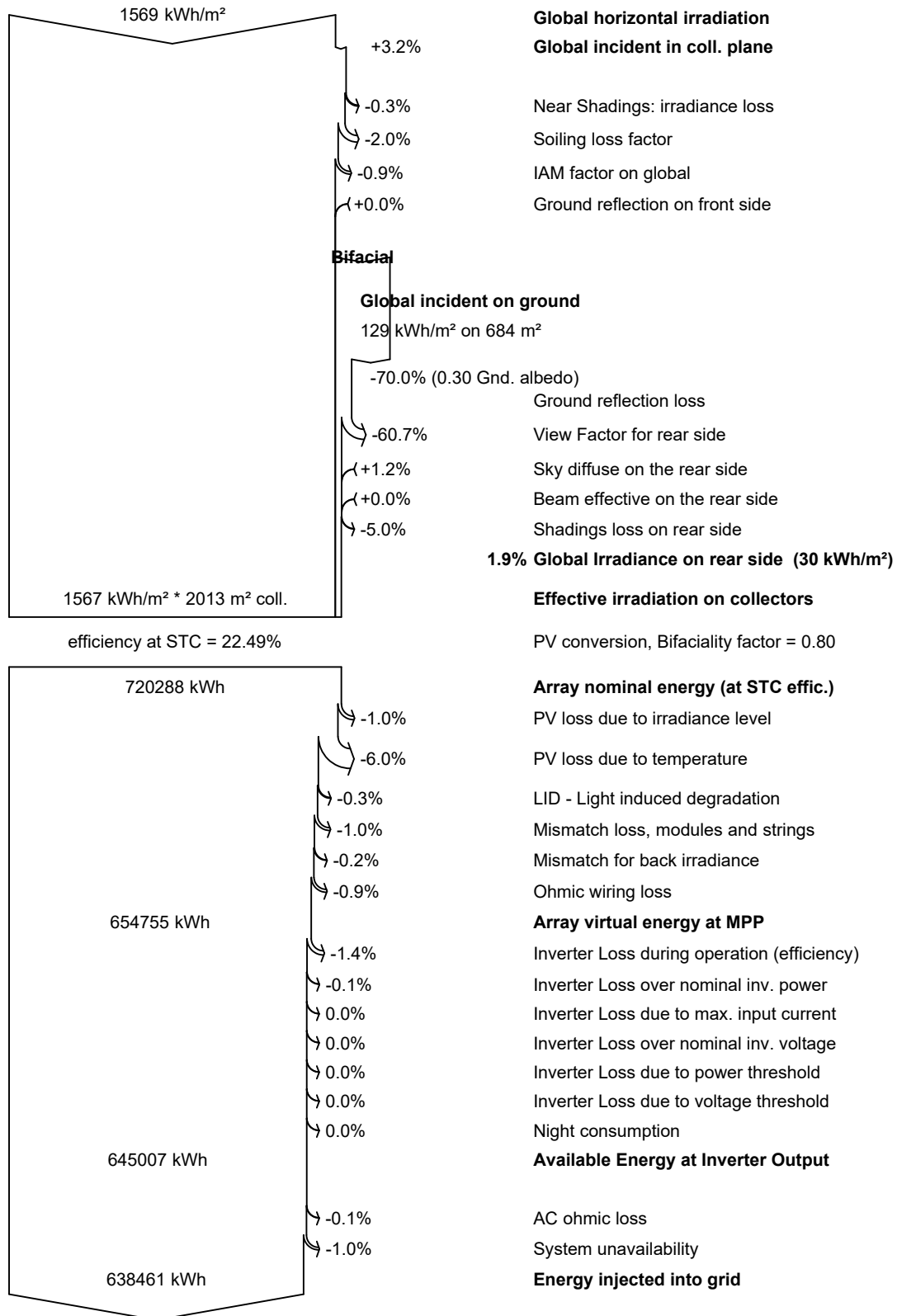
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	91.2	55.7	15.08	99.9	96.4	42099	41488	0.918
February	115.3	56.5	19.83	124.6	120.8	51549	48355	0.858
March	161.4	73.9	26.29	170.0	164.9	68466	67474	0.877
April	173.2	87.7	31.43	175.7	170.3	69542	68566	0.862
May	184.7	102.0	34.97	183.6	177.9	72161	68847	0.829
June	153.8	100.5	33.35	151.1	146.2	60124	57792	0.845
July	134.5	90.2	30.70	132.3	127.8	53126	52315	0.874
August	130.9	83.5	29.92	130.9	126.5	52627	51825	0.875
September	126.8	74.8	28.98	130.6	126.3	52547	51757	0.876
October	115.9	75.9	27.37	121.7	117.8	49401	48679	0.884
November	94.5	60.4	21.88	102.2	98.7	42144	41532	0.898
December	86.9	49.8	17.22	96.6	93.4	40426	39829	0.911
Year	1569.1	911.0	26.44	1619.2	1566.9	654213	638461	0.872

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		



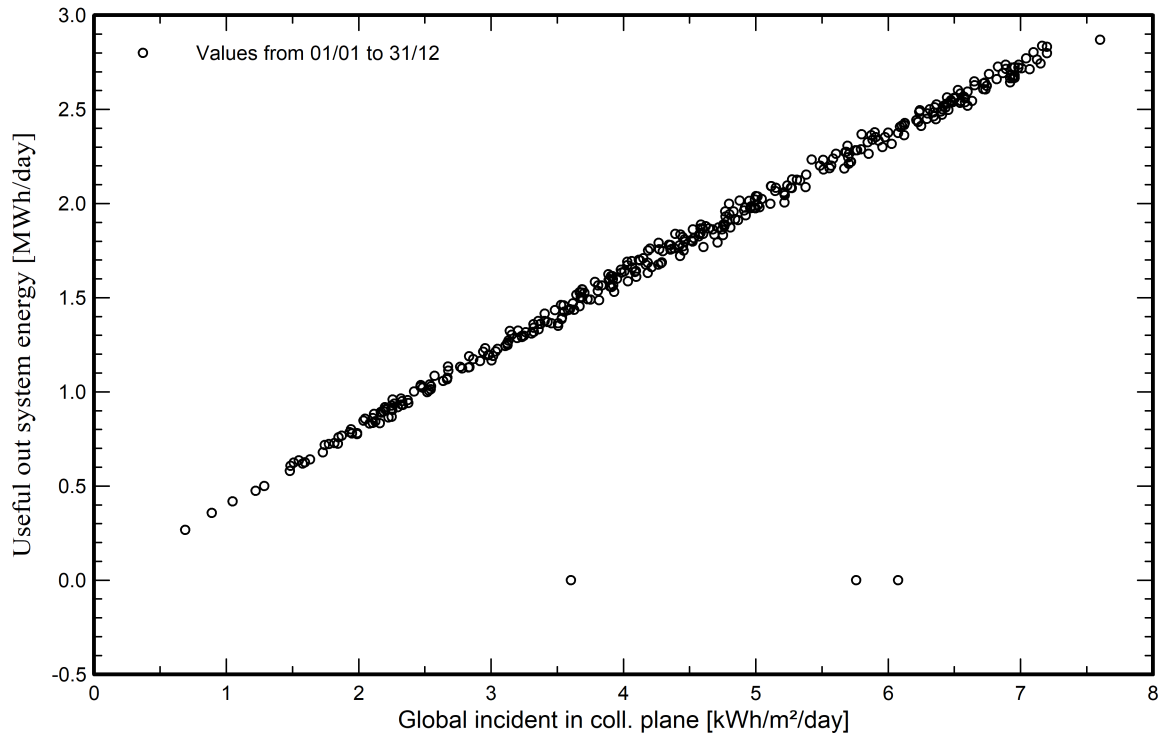
Loss diagram



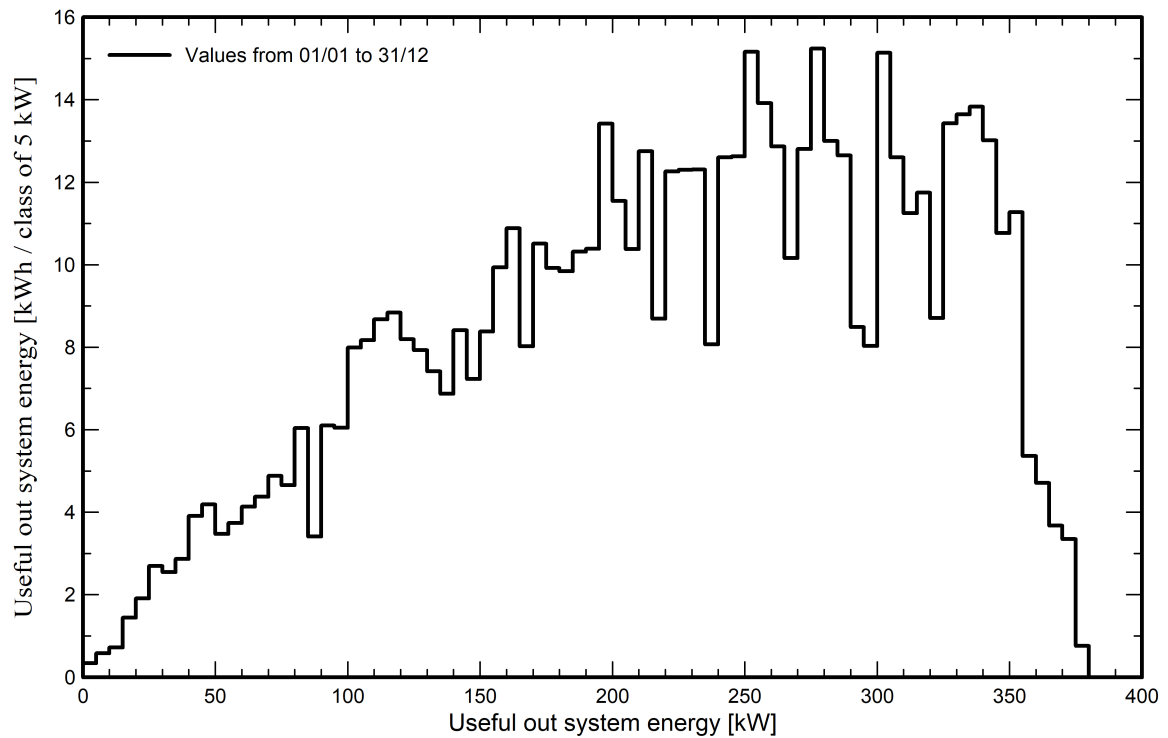


Predef. graphs

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 %

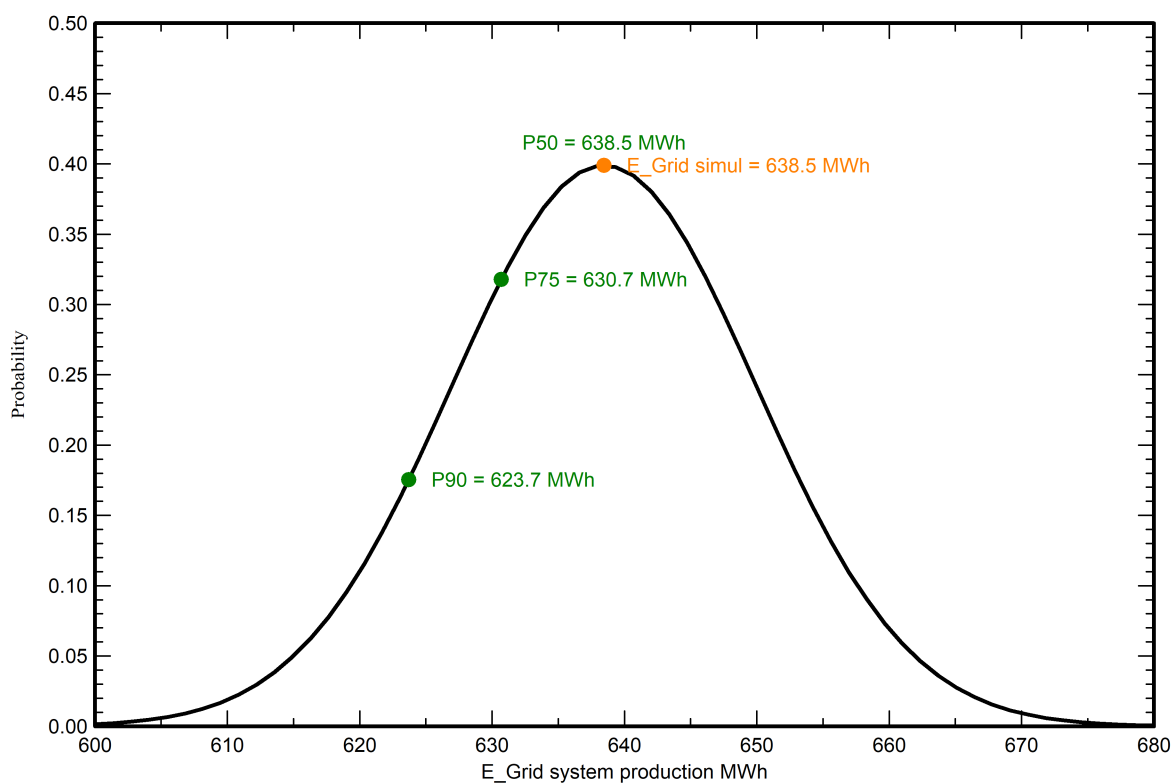
Simulation and parameters uncertainties

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 11.5 MWh
P50 638.5 MWh
P90 623.7 MWh
P75 630.7 MWh

Probability distribution

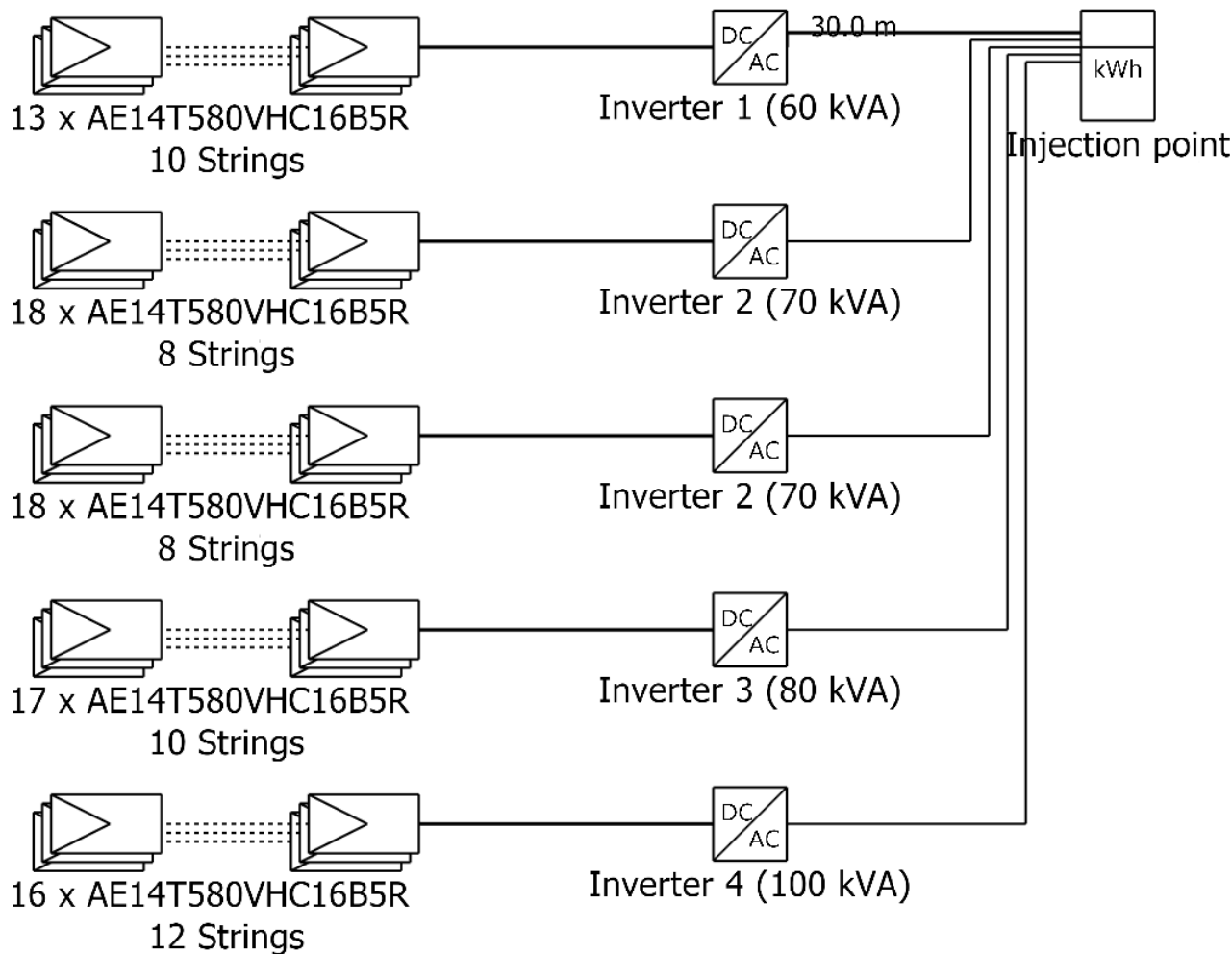




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MAX 60KTL3 LV
Inverter 2	MAX 70KTL3 MV
Inverter 3	MAX 80KTL3 LV
Inverter 4	MAX 100KTL3-X LV
String 1	13 x AE14T580VHC16B5R
String 2	18 x AE14T580VHC16B5R
String 3	17 x AE14T580VHC16B5R
String 4	16 x AE14T580VHC16B5R

Tej Prayagraj hospital

Jakson Limited (In
dia)

VC0 : New simulation variant

04/12/24