

# PVsyst - Simulation report

## Grid-Connected System

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Project: DeenDayal Hospital Aligarh

Variant: New simulation variant

Unlimited sheds

System power: 499 kWp

Kuārsi - India

**Author**

Jakson Limited (India)



## PVsyst V8.0.2

VC0, Simulation date:  
27/11/24 16:44  
with V8.0.2

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## Project summary

## Geographical Site

Kuārsi

India

## Situation

Latitude 27.90 °N

Longitude 78.10 °E

Altitude 195 m

Time zone UTC+5.5

## Project settings

Albedo 0.20

## Weather data

Kuārsi

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

## System summary

## Grid-Connected System

## Orientation #1

## Sheds

Tilt 10 °

Azimuth -11 °

## Unlimited sheds

## Near Shadings

Mutual shadings of sheds

## User's needs

Unlimited load (grid)

## System information

## PV Array

Nb. of modules

861 units

Pnom total

499 kWp

## Inverters

Nb. of units

6 units

Pnom total

450 kWac

Pnom ratio

1.110

## Results summary

Produced Energy	777306 kWh/year	Specific production	1557 kWh/kWp/year	Perf. Ratio PR	93.34 %
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## General parameters

## Grid-Connected System

## Unlimited sheds

## Orientation #1

## Sheds

Tilt	10 °
Azimuth	-11 °

## Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	9 °

## Sizes

Sheds spacing	6.30 m
Collector width	3.00 m
Average GCR	47.6 %
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	6.30 m
Sheds width	3.04 m
Limit profile angle	9.0 °
GCR	48.3 %
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	51 units
Nominal (STC)	29.58 kWp
Modules	3 string x 17 In series

## At operating cond. (50°C)

Pmpp	27.43 kWp
U mpp	698 V
I mpp	39 A

## Inverter

Manufacturer	Growatt New Energy
Model	MID 40KTL3-X
(Original PVsyst database)	
Unit Nom. Power	40.0 kWac
Number of inverters	1 unit
Total power	40.0 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	0.74
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 modules420 units  
Nominal (STC)244 kWp  
Modules28 string x 15 In series

## At operating cond. (50°C)

Pmpp226 kWp  
U mpp616 V  
I mpp367 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 modules390 units  
Nominal (STC)226 kWp  
Modules26 string x 15 In series

## At operating cond. (50°C)

Pmpp210 kWp  
U mpp616 V  
I mpp341 A

## Total PV power

Nominal (STC)499 kWp  
Total861 modules  
Module area2222 m<sup>2</sup>

## Inverter

Manufacturer

Growatt New Energy

Model

MAX 70KTL3 LV

(Original PVsyst database)

Unit Nom. Power70.0 kWac  
Number of inverters3 units  
Total power210 kWac  
Operating voltage200-1000 V  
Pnom ratio (DC:AC)1.16  
Power sharing within this inverter

## Inverter

Manufacturer

Growatt New Energy

Model

MAX 100KTL3-X LV

(Original PVsyst database)

Unit Nom. Power100 kWac  
Number of inverters2 units  
Total power200 kWac  
Operating voltage180-1000 V  
Pnom ratio (DC:AC)1.13  
Power sharing within this inverter

## Total inverter power

Total power450 kWac  
Number of inverters6 units  
Pnom ratio1.11

## Array losses

## Array Soiling Losses

Loss Fraction2.0 %

## Thermal Loss factor

Module temperature according to irradiance

Uc (const)29.0 W/m<sup>2</sup>KUv (wind)0.0 W/m<sup>2</sup>K/m/s

## Serie Diode Loss

Voltage drop0.7 V

Loss Fraction0.1 % at STC

## LID - Light Induced Degradation

Loss Fraction0.3 %

## Module Quality Loss

Loss Fraction0.0 %

## Module mismatch losses

Loss Fraction0.5 % 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. 289 mΩ  
Loss Fraction 1.5 % at STC

**Array #3 - Sub-array #3**

Global array res. 29 mΩ  
Loss Fraction 1.5 % at STC

**Array #2 - Sub-array #2**

Global array res. 27 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 0.02 % at STC

**Inverter: MID 40KTL3-X**

Wire section (1 Inv.) Alu 1 x 3 x 70 mm<sup>2</sup>  
Wires length 50 m

**Inverter: MAX 100KTL3-X LV**

Wire section (2 Inv.) Alu 2 x 3 x 95 mm<sup>2</sup>  
Average wires length 0 m

**Inverter: MAX 70KTL3 LV**

Wire section (3 Inv.) Alu 3 x 3 x 50 mm<sup>2</sup>  
Average wires length 0 m



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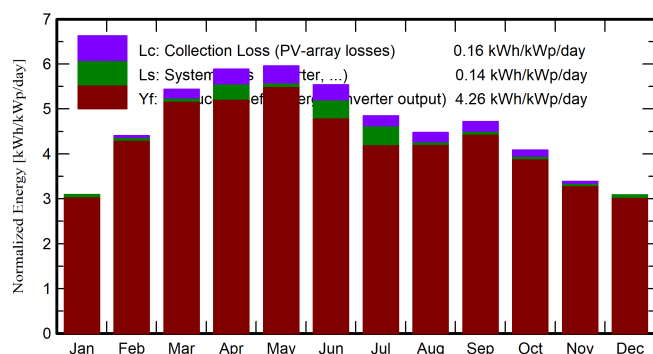
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## Main results

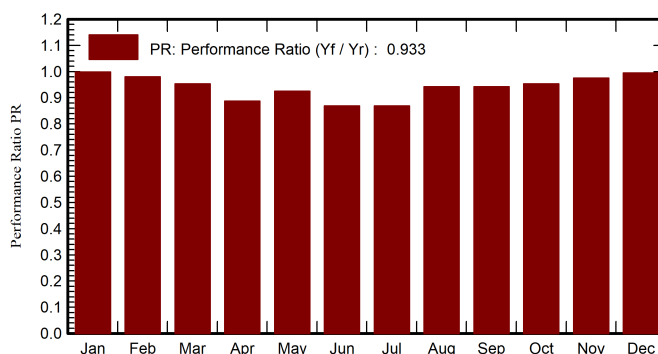
## System Production

Produced Energy (P50)	777306 kWh/year	Specific production (P50)	1557 kWh/kWp/year	Perf. Ratio PR	93.34 %
Produced Energy (P90)	759337 kWh/year	Specific production (P90)	1521 kWh/kWp/year		
Produced Energy (P75)	767859 kWh/year	Specific production (P75)	1538 kWh/kWp/year		

## Normalized productions (per installed kWp)



## Performance Ratio PR



## Balances and main results

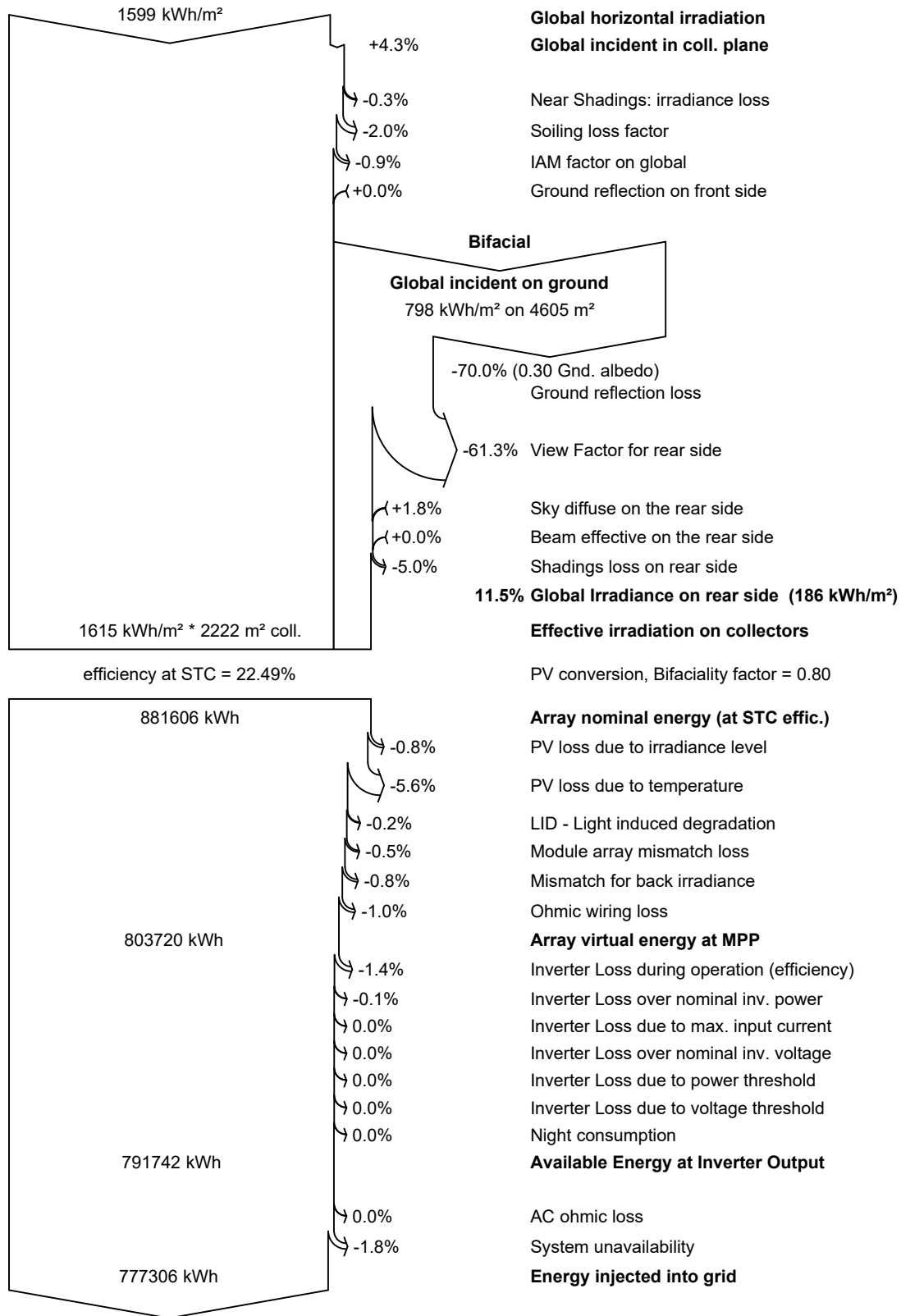
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	°C	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	kWh	kWh	ratio
January	84.8	50.78	13.31	94.7	91.6	47937	47229	0.998
February	111.5	54.15	17.58	123.3	119.5	61147	60293	0.979
March	158.3	74.79	23.90	168.5	163.5	81357	80252	0.954
April	172.0	85.64	29.76	176.5	171.3	83391	78236	0.887
May	185.0	98.62	33.50	184.7	179.1	86509	85304	0.925
June	168.0	92.50	33.10	166.0	161.0	78044	72040	0.869
July	151.9	98.73	31.48	150.3	145.3	71697	65195	0.869
August	137.6	88.72	30.46	138.8	134.2	66254	65280	0.942
September	135.9	76.06	29.20	141.6	137.2	67588	66605	0.942
October	118.1	70.84	26.68	126.7	122.7	61200	60327	0.953
November	91.8	56.20	20.32	101.6	98.2	50184	49488	0.976
December	83.8	49.91	15.01	94.7	91.7	47751	47059	0.995
Year	1598.6	896.93	25.39	1667.5	1615.3	803061	777306	0.933

## 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		



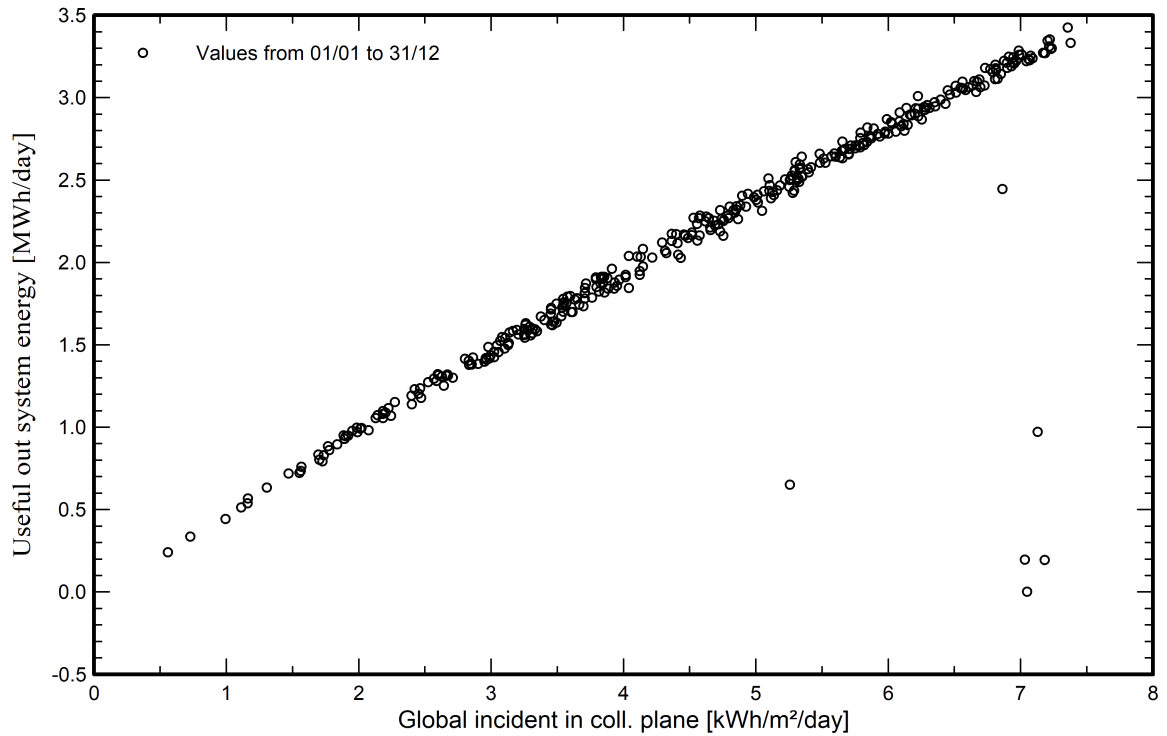
### Loss diagram



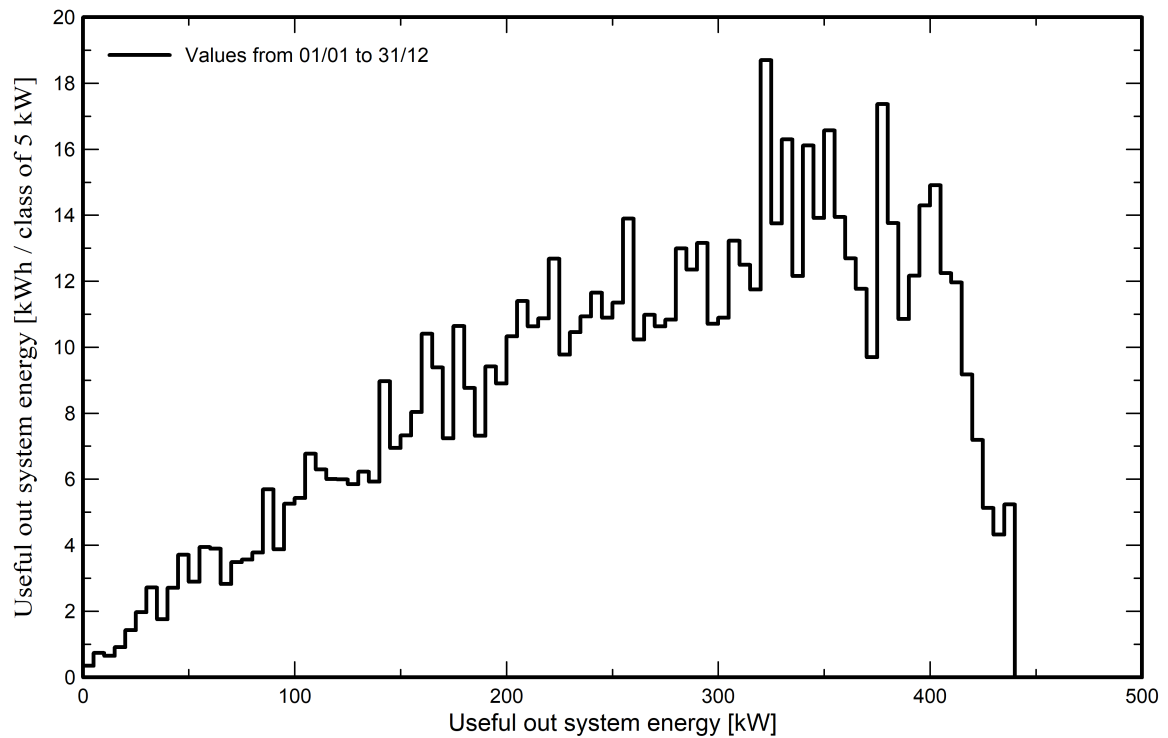


Predef. graphs

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 %

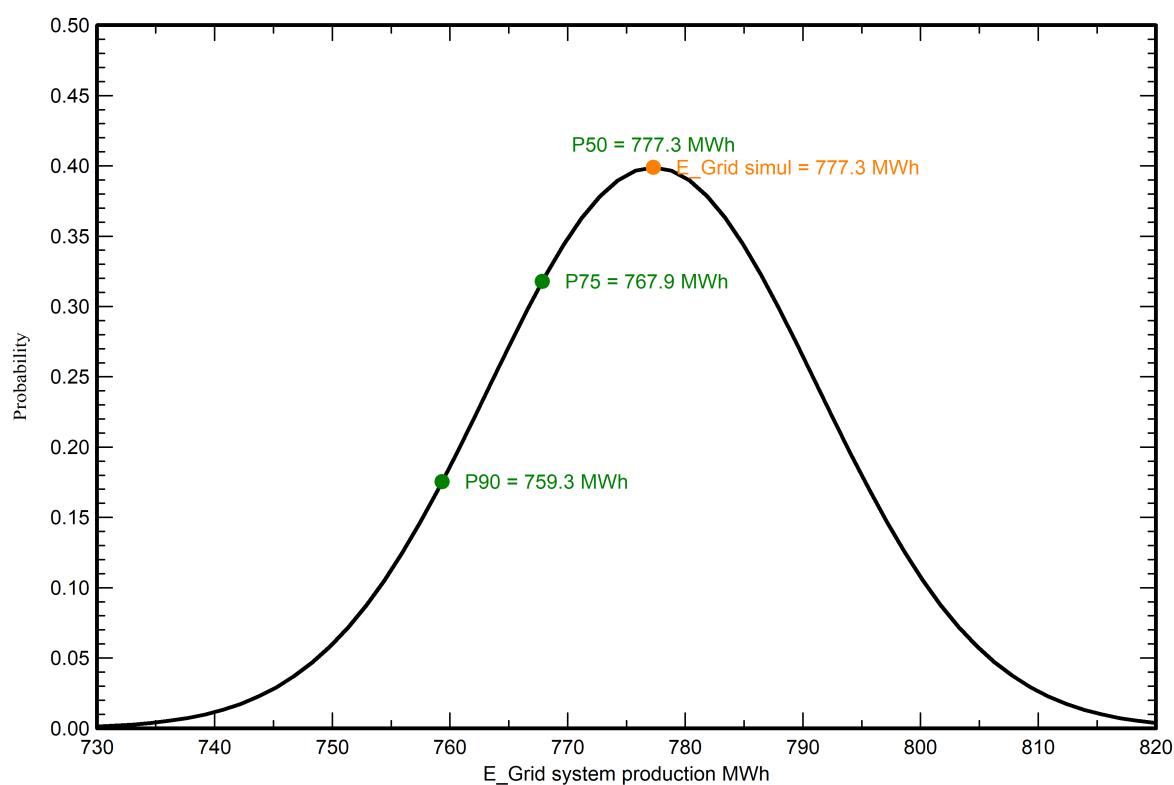
#### Simulation and parameters uncertainties

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 14.0 MWh  
P50 777.3 MWh  
P90 759.3 MWh  
P75 767.9 MWh

### Probability distribution

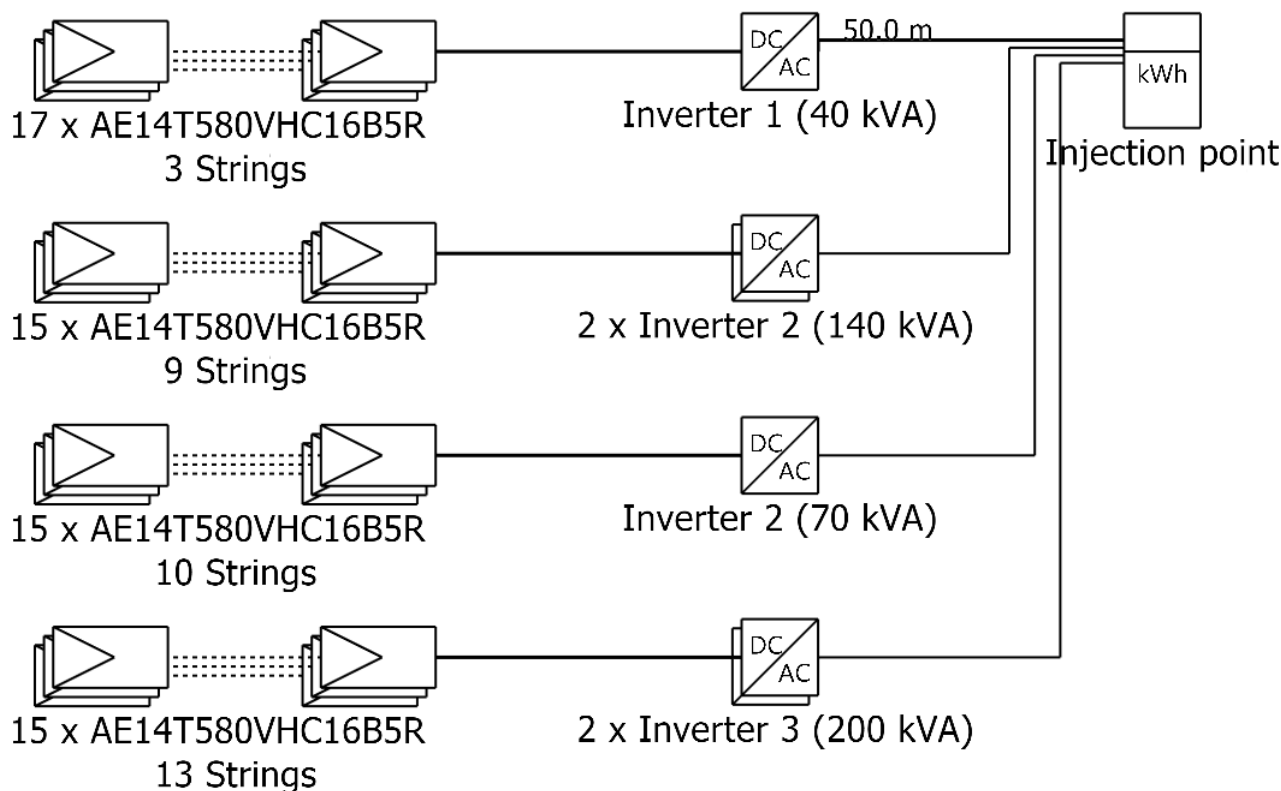




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# Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MID 40KTL3-X
Inverter 2	MAX 70KTL3 LV
Inverter 3	MAX 100KTL3-X LV
String 1	17 x AE14T580VHC16B5R
String 2	15 x AE14T580VHC16B5R

DeenDayal Hospital Aligarh

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dia)

VC0 : New simulation variant

27/11/24