

PVsyst - Simulation report

Grid-Connected System

Project: Lok Bandhu hospital

Variant: New simulation variant

Unlimited sheds

System power: 520 kWp

Lucknow - India

Author

Jakson Limited (India)

**PVsyst V8.0.2**

VC0, Simulation date:
27/11/24 16:37
with V8.0.2

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Project summary**Geographical Site****Lucknow**

India

Situation

Latitude 26.79 °N

Longitude 80.90 °E

Altitude 117 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Lucknow

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

System summary**Grid-Connected System****Orientation #1****Sheds**

Tilt 10 °

Azimuth 14 °

Unlimited sheds**Near Shadings**

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules

896 units

Pnom total

520 kWp

Inverters

Nb. of units

5 units

Pnom total

430 kWac

Pnom ratio

1.209

Results summary

Produced Energy 780444 kWh/year Specific production 1502 kWh/kWp/year Perf. Ratio PR 93.88 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt	10 °
Azimuth	14 °

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	6.40 m
Sheds width	3.04 m
Limit profile angle	8.7 °
GCR	47.5 %
Height above ground	2.00 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	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

Near Shadings

Mutual shadings of sheds

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	68 units
Nominal (STC)	39.4 kWp
Modules	4 string x 17 In series

At operating cond. (50°C)

Pmpp	36.6 kWp
U mpp	698 V
I mpp	52 A

Inverter

Manufacturer	Growatt New Energy
Model	MAC 30KTL3-X LV

(Original PVsyst database)

Unit Nom. Power	30.0 kWac
Number of inverters	1 unit
Total power	30.0 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.31
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 828 units
Nominal (STC) 480 kWp
Modules 46 string x 18 In series

At operating cond. (50°C)

Pmpp 445 kWp
U mpp 739 V
I mpp 602 A

Total PV power

Nominal (STC) 520 kWp
Total 896 modules
Module area 2313 m²

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) 1.20
Power sharing within this inverter

Total inverter power

Total power 430 kWac
Number of inverters 5 units
Pnom ratio 1.21

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

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 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 217 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 20 mΩ
Loss Fraction 1.5 % at STC

System losses

Unavailability of the system

Time fraction 1.0 %
3.7 days,
3 periods



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AC wiring losses

Inv. output line up to injection point

Inverter voltage	400 Vac tri
Loss Fraction	0.03 % at STC

Inverters: MAC 30KTL3-X LV, MAX 100KTL3-X LV

Wire section (5 Inv.)	Alu 5 x 3 x 95 mm ²
Average wires length	10 m

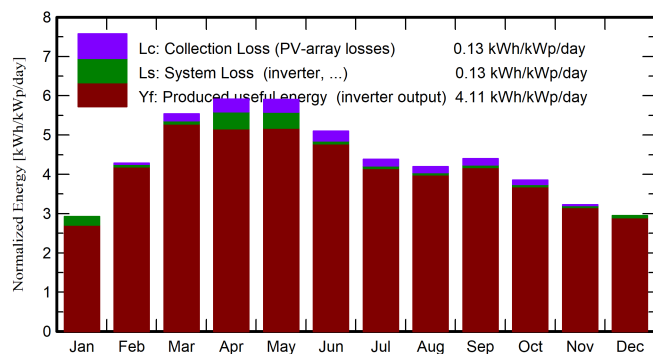


Main results

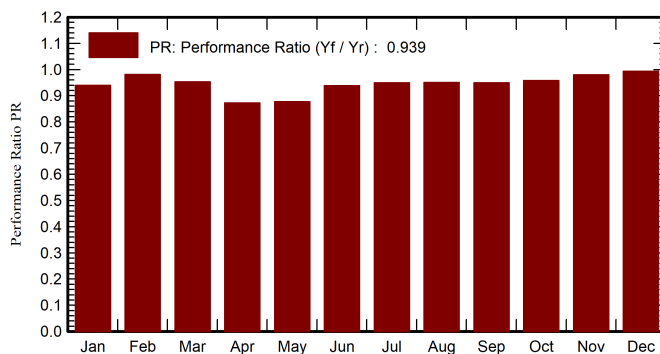
System Production

Produced Energy (P50)	780444 kWh/year	Specific production (P50)	1502 kWh/kWp/year	Perf. Ratio PR	93.88 %
Produced Energy (P90)	762403 kWh/year	Specific production (P90)	1467 kWh/kWp/year		
Produced Energy (P75)	770959 kWh/year	Specific production (P75)	1484 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

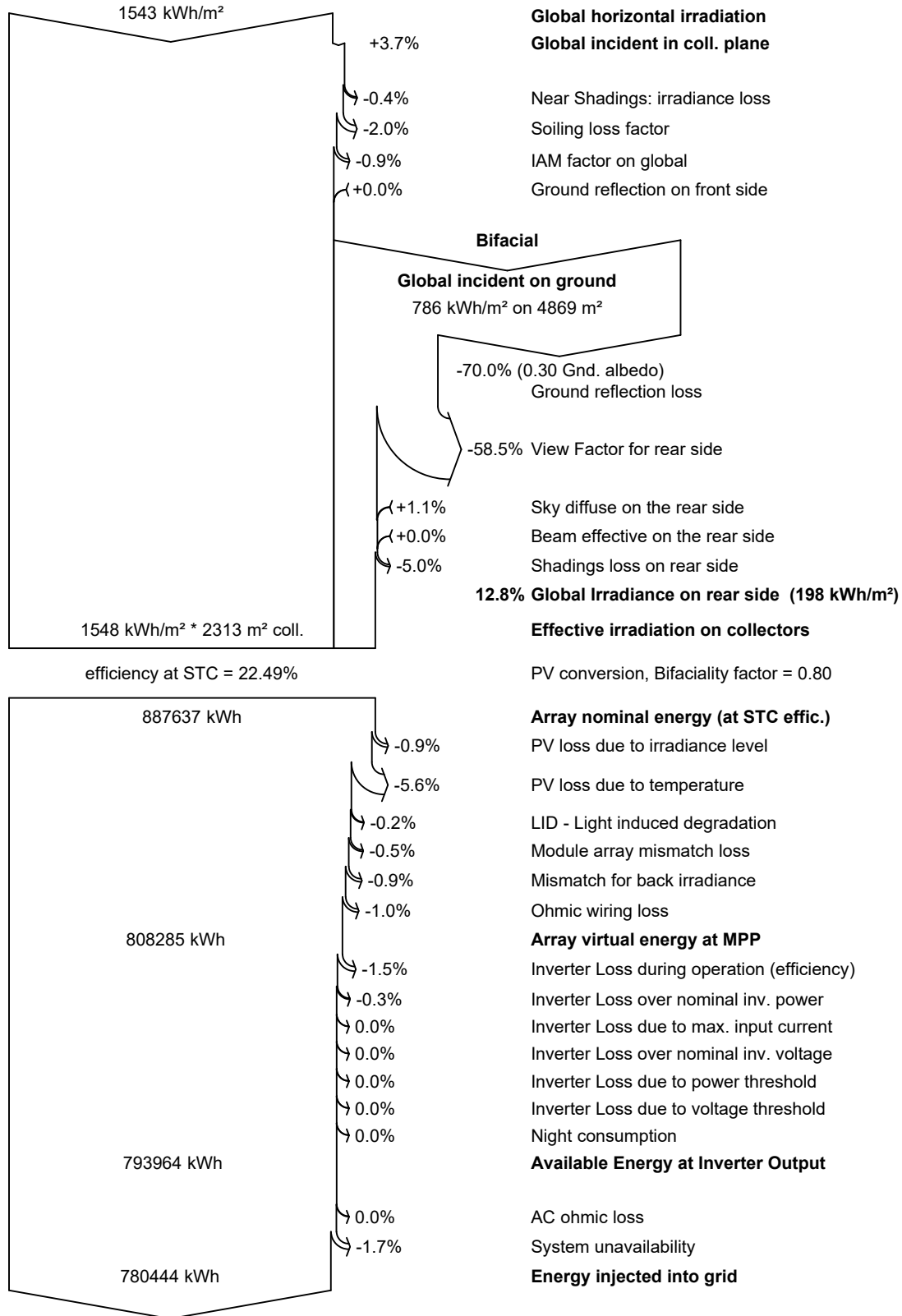
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	81.2	49.68	14.12	89.6	86.6	47165	43751	0.940
February	109.7	59.01	18.43	119.9	116.1	61999	61082	0.981
March	161.4	73.96	24.11	171.8	166.7	86429	85155	0.954
April	173.3	87.06	29.84	177.4	172.0	87218	80458	0.873
May	183.9	99.93	32.64	183.2	177.6	90030	83471	0.877
June	155.3	98.44	32.15	152.9	148.0	75717	74561	0.938
July	137.6	90.00	29.95	135.8	131.3	68048	66993	0.949
August	129.8	92.40	29.44	130.1	125.6	65270	64281	0.951
September	127.4	75.84	28.48	132.0	127.6	66129	65132	0.949
October	112.7	71.85	26.25	119.5	115.6	60365	59446	0.958
November	89.1	60.31	20.53	96.9	93.6	50054	49323	0.979
December	81.6	54.61	15.72	90.7	87.5	47496	46795	0.993
Year	1542.9	913.10	25.17	1599.7	1548.4	805919	780444	0.939

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		



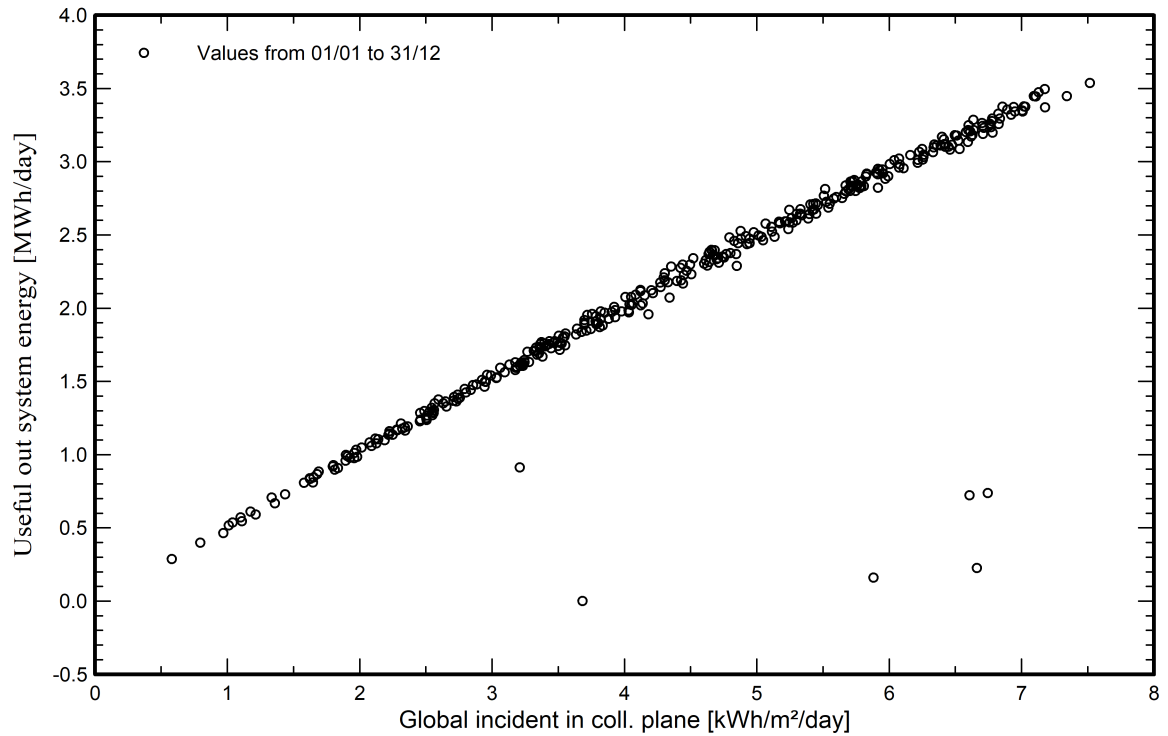
Loss diagram



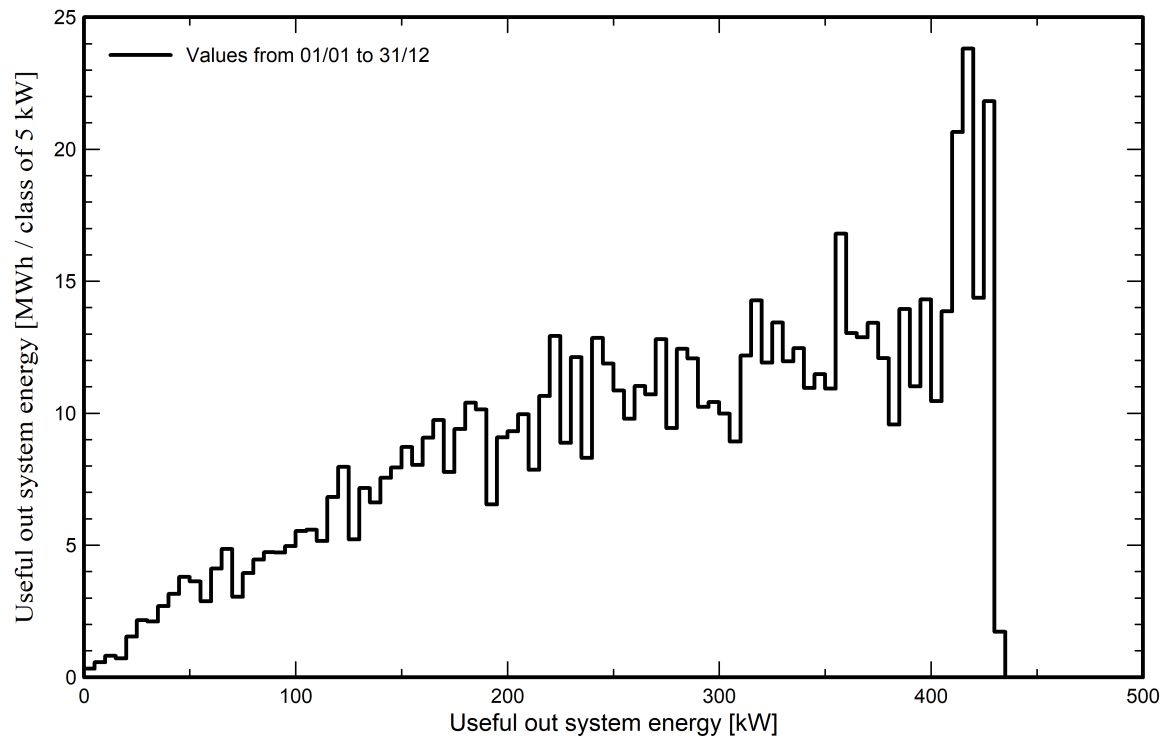


Predef. graphs

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 %

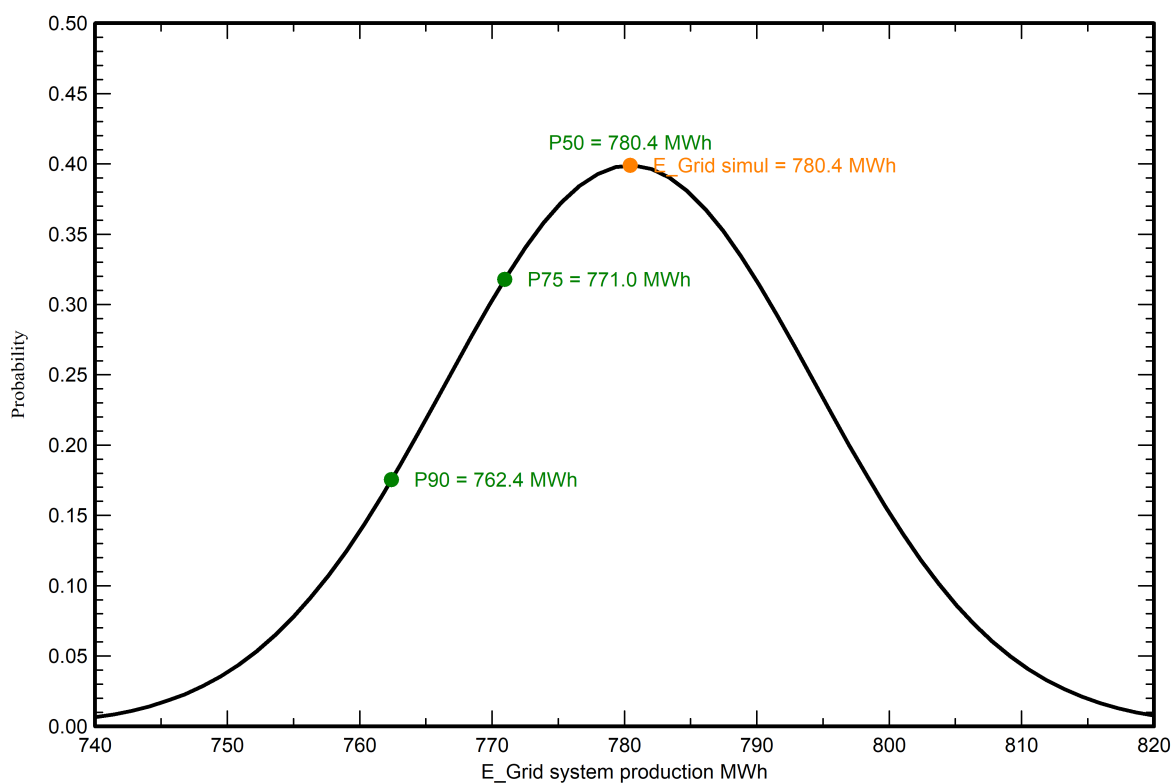
Simulation and parameters uncertainties

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 14.1 MWh
P50 780.4 MWh
P90 762.4 MWh
P75 771.0 MWh

Probability distribution

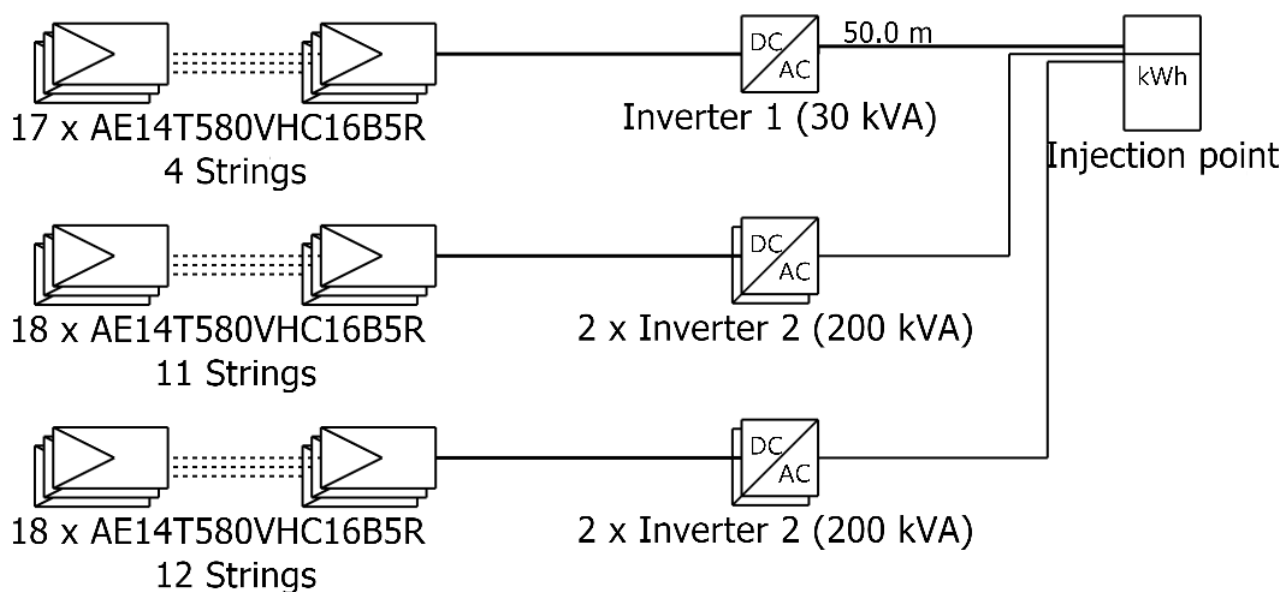




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MAC 30KTL3-X LV
Inverter 2	MAX 100KTL3-X LV
String 1	17 x AE14T580VHC16B5R
String 2	18 x AE14T580VHC16B5R

Lok Bandhu hospital

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27/11/24