

PVsyst - Simulation report

Grid-Connected System

Project: District Hospital Basti

Variant: New simulation variant

Unlimited sheds

System power: 316 kWp

Basti - India

Author

Jakson Limited (India)

**PVsyst V8.0.0**

VC1, Simulation date:
20/11/24 14:54
with V8.0.0

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Project summary**Geographical Site****Basti**

India

Situation

Latitude 26.80 °N

Longitude 82.76 °E

Altitude 89 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Basti

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

544 units

Pnom total

316 kWp

Inverters

Nb. of units

5 units

Pnom total

270 kWac

Pnom ratio

1.169

Results summary

Produced Energy 445111 kWh/year Specific production 1411 kWh/kWp/year Perf. Ratio PR 90.80 %

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General parameters

Grid-Connected System

Unlimited sheds

Orientation #1

Sheds

Tilt	10 °
Azimuth	14 °

Sheds configuration

Nb. of sheds	4 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	1.50 m
Nb. of sheds	4 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

ManufacturePanasonic Life Solutions India Pvt. Ltd
ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power	580 Wp
Number of PV modules	408 units
Nominal (STC)	237 kWp
Modules	24 string x 17 In series

At operating cond. (50°C)

Pmpp	219 kWp
U mpp	698 V
I mpp	314 A

Inverter

ManufacturerGrowatt New Energy
ModelMAC 50KTL3-X LV

(Custom parameters definition)

Unit Nom. Power	50.0 kWac
Number of inverters	4 units
Total power	200 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.18
Power sharing within this inverter	



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 136 units
 Nominal (STC) 78.9 kWp
 Modules 8 string x 17 In series

At operating cond. (50°C)

Pmpp 73.1 kWp
 U mpp 698 V
 I mpp 105 A

Total PV power

Nominal (STC) 316 kWp
 Total 544 modules
 Module area 1404 m²

Inverter

Manufacturer

Growatt New Energy

Model

MAX 70KTL3 LV

(Original PVsyst database)

Unit Nom. Power 70.0 kWac
 Number of inverters 1 unit
 Total power 70.0 kWac
 Operating voltage 200-1000 V
 Pnom ratio (DC:AC) 1.13
 Power sharing within this inverter

Total inverter power

Total power 270 kWac
 Number of inverters 5 units
 Pnom ratio 1.17

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 2.0 %

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

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. 36 mΩ

Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 109 mΩ

Loss Fraction 1.5 % at STC

System losses

Unavailability of the system

Time fraction 1.0 %
 3.7 days,
 3 periods

Auxiliaries loss

constant (fans) 1000 W
 0.0 kW from Power thresh.



AC wiring losses

Inv. output line up to injection point

Inverter voltage 400 Vac tri
Loss Fraction 1.47 % at STC

Inverter: MAC 50KTL3-X LV

Wire section (4 Inv.) Alu 4 x 3 x 35 mm²
Average wires length 60 m

Inverter: MAX 70KTL3 LV

Wire section (1 Inv.) Alu 1 x 3 x 50 mm²
Wires length 0 m



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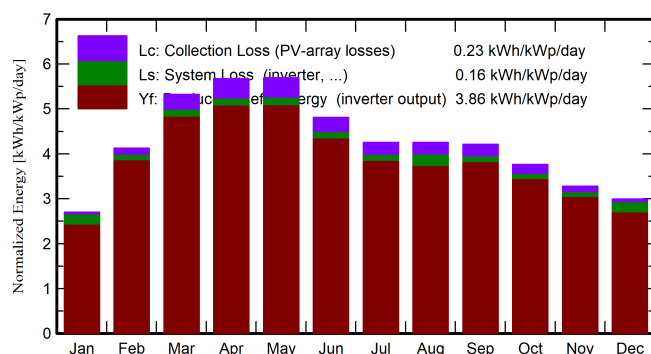
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Main results

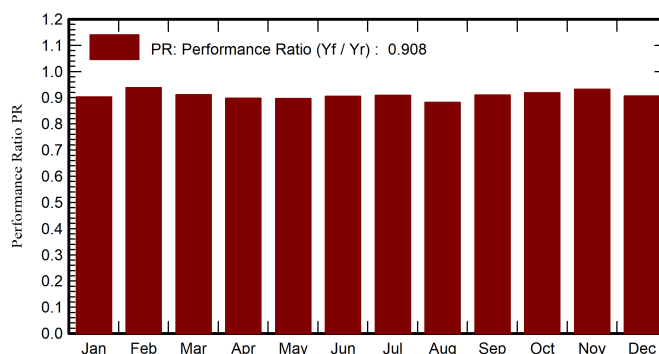
System Production

Produced Energy (P50)	445111 kWh/year	Specific production (P50)	1411 kWh/kWp/year	Perf. Ratio PR	90.80 %
Produced Energy (P90)	433345 kWh/year	Specific production (P90)	1373 kWh/kWp/year		
Produced Energy (P75)	438925 kWh/year	Specific production (P75)	1391 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

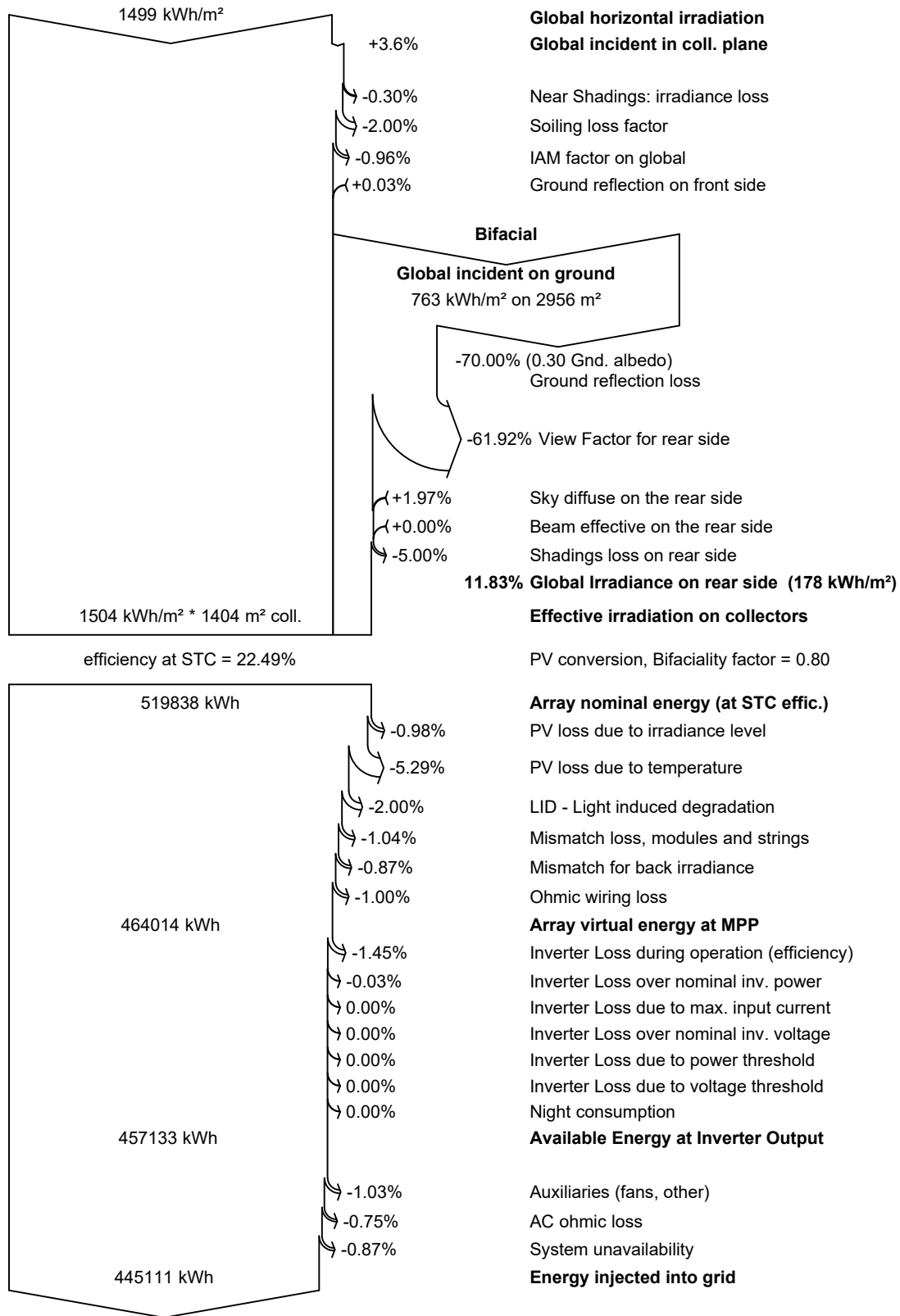
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	76.5	52.25	14.37	83.9	81.0	26151	23895	0.903
February	106.5	61.73	19.17	115.6	112.0	35327	34233	0.939
March	155.3	74.48	24.73	165.0	160.1	48958	47436	0.911
April	166.6	87.93	29.41	170.2	165.0	49752	48220	0.898
May	177.5	99.90	31.10	176.6	171.2	51562	49947	0.897
June	146.6	97.91	30.69	144.4	139.7	42632	41261	0.906
July	133.1	90.65	29.48	131.8	127.5	39105	37796	0.909
August	131.6	90.90	29.31	131.8	127.4	39180	36670	0.882
September	122.2	73.78	28.35	126.4	122.2	37507	36274	0.910
October	110.3	74.25	26.20	116.7	112.8	34963	33841	0.919
November	89.6	56.75	20.99	98.4	95.2	29957	28964	0.933
December	83.1	53.92	16.34	92.9	89.8	28782	26575	0.906
Year	1498.9	914.45	25.04	1553.6	1503.8	463876	445111	0.908

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		



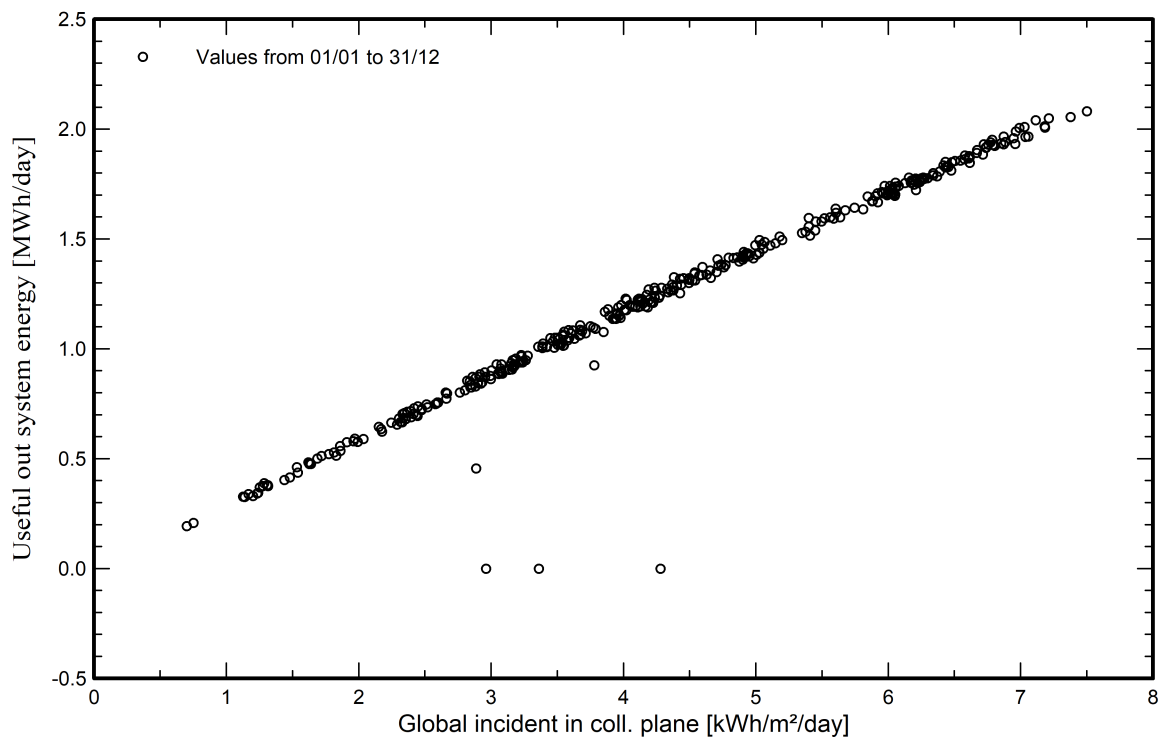
Loss diagram



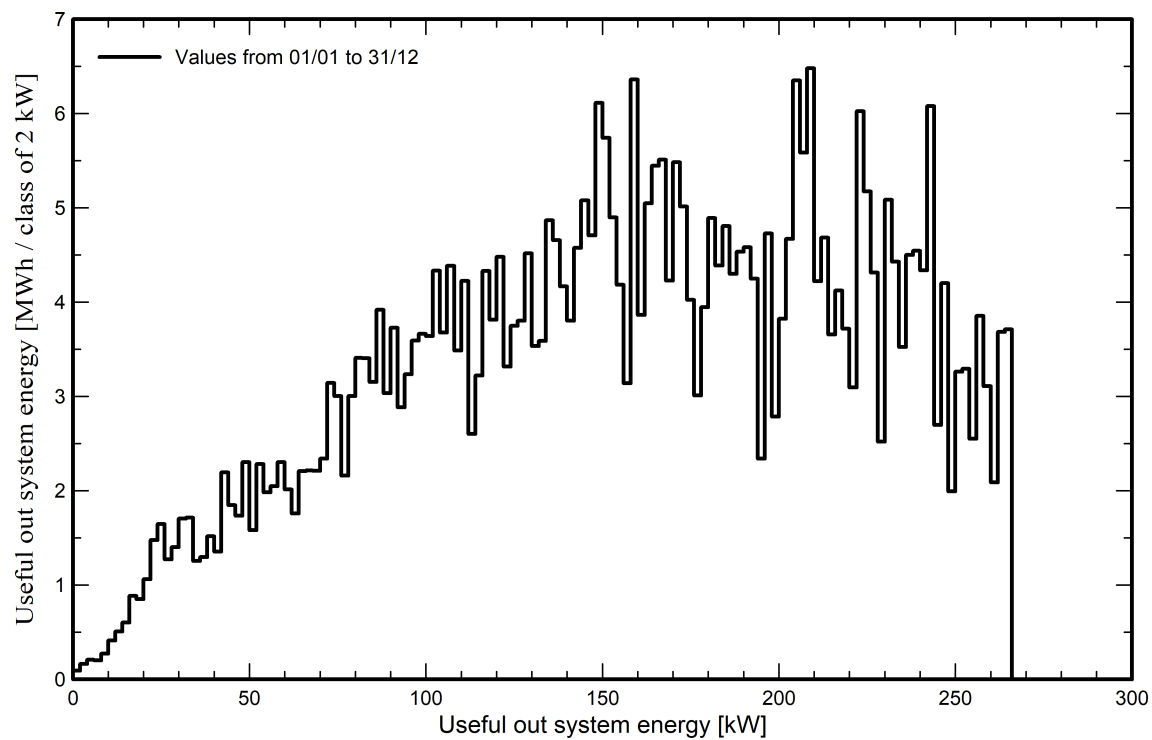


Predef. graphs

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) -1.0 %

Specified Deviation

Global variability (weather data + system)

Variability (Quadratic sum) 2.1 %

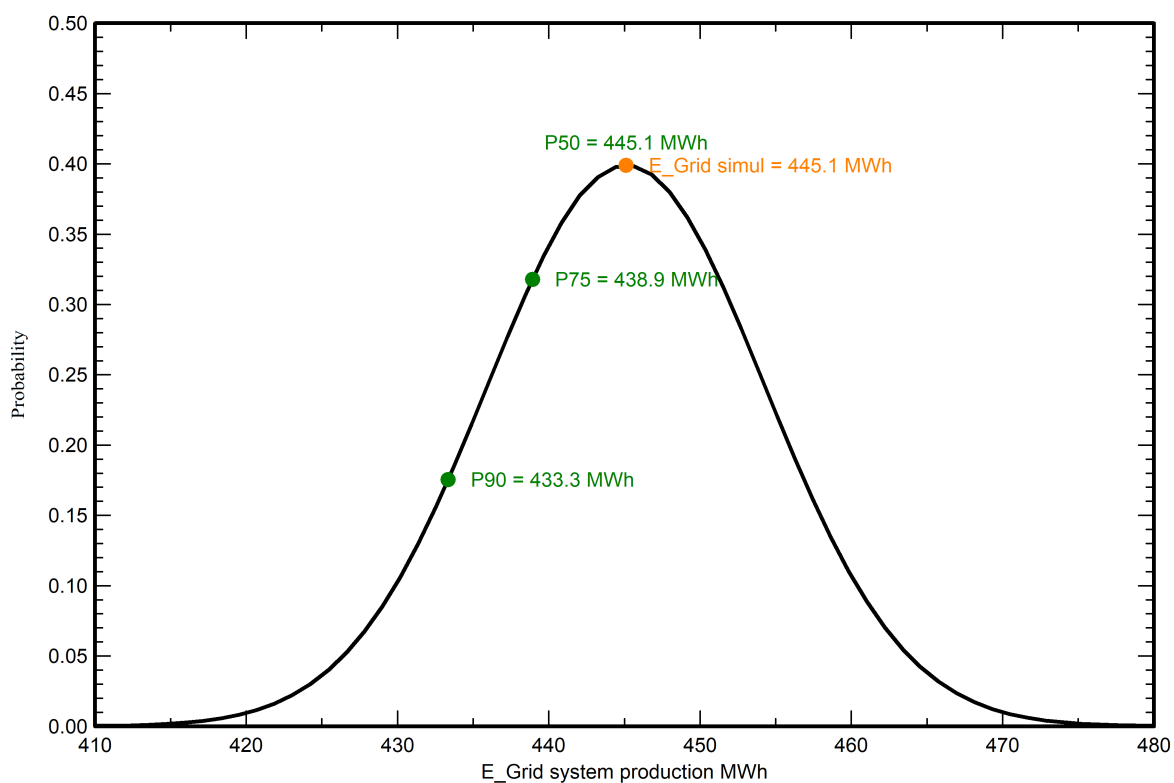
Simulation and parameters uncertainties

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 9.2 MWh
P50 445.1 MWh
P90 433.3 MWh
P75 438.9 MWh

Probability distribution

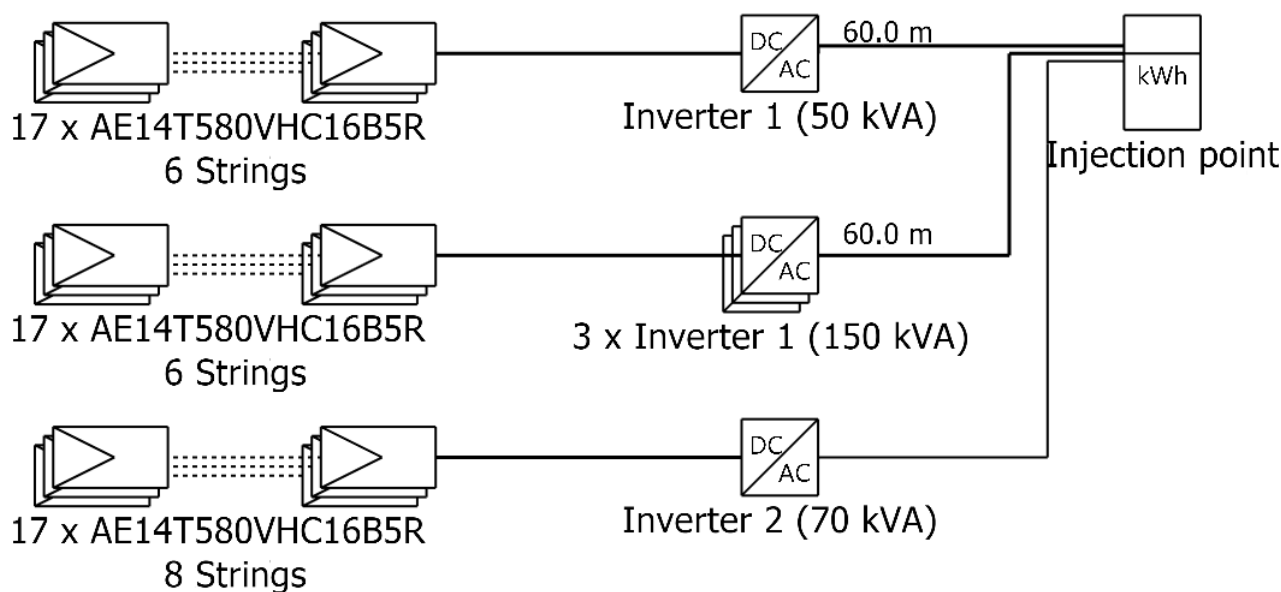




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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MAC 50KTL3-X LV
Inverter 2	MAX 70KTL3 LV
String	17 x AE14T580VHC16B5R

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