

PVsyst - Simulation report

Grid-Connected System

Project: District Hospital Bahraich

Variant: New simulation variant

Unlimited sheds

System power: 723 kWp

Ghasiāri Purwa - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
27/11/24 17:23
with V8.0.2

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Project summary

Geographical Site

Ghasiāri Purwa

India

Situation

Latitude 27.57 °N

Longitude 81.61 °E

Altitude 118 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Ghasiāri Purwa

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

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth 8 °

Unlimited sheds

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

1247 units

Pnom total

723 kWp

Inverters

Nb. of units

7 units

Pnom total

600 kWac

Pnom ratio

1.205

Results summary

Produced Energy 995.96 MWh/year Specific production 1377 kWh/kWp/year Perf. Ratio PR 86.52 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt	10 °
Azimuth	8 °

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

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	84 units
Nominal (STC)	48.7 kWp
Modules	6 string x 14 In series

At operating cond. (50°C)

Pmpp	45.2 kWp
U mpp	575 V
I mpp	79 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)	1.22
Power sharing within this inverter	

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	315 units
Nominal (STC)	183 kWp
Modules	21 string x 15 In series

At operating cond. (50°C)

Pmpp	169 kWp
U mpp	616 V
I mpp	275 A

Inverter

Manufacturer Growatt New Energy
Model MAX 80KTL3 LV
(Original PVsyst database)

Unit Nom. Power	80.0 kWac
Number of inverters	2 units
Total power	160 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.14
Power sharing within this inverter	



PV Array Characteristics

Array #3 - Sub-array #3

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)

Unit Nom. Power 580 Wp
Number of PV modules 848 units
Nominal (STC) 492 kWp
Modules 53 string x 16 In series

At operating cond. (50°C)

Pmpp 456 kWp
U mpp 657 V
I mpp 694 A

Total PV power

Nominal (STC) 723 kWp
Total 1247 modules
Module area 3218 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) 1.23
Power sharing within this inverter

Total inverter power

Total power 600 kWac
Number of inverters 7 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 9.9 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 119 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. 15 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 0.02 % at STC

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

Wire section (3 Inv.) Alu 3 x 3 x 70 mm²
Average wires length 7 m

Inverter: MAX 100KTL3-X LV

Wire section (4 Inv.) Alu 4 x 3 x 95 mm²
Average wires length 0 m



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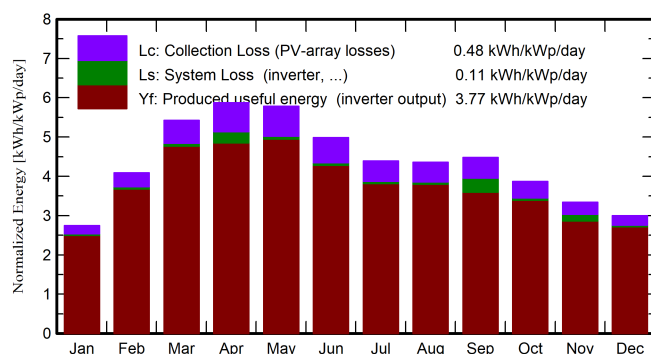
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Main results

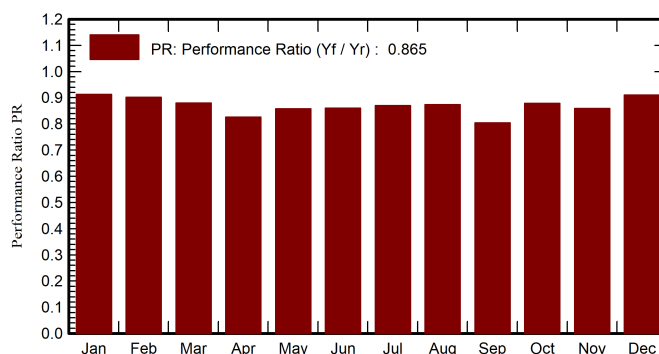
System Production

Produced Energy (P50)	995.96 MWh/year	Specific production (P50)	1377 kWh/kWp/year	Perf. Ratio PR	86.52 %
Produced Energy (P90)	972.94 MWh/year	Specific production (P90)	1345 kWh/kWp/year		
Produced Energy (P75)	983.86 MWh/year	Specific production (P75)	1360 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

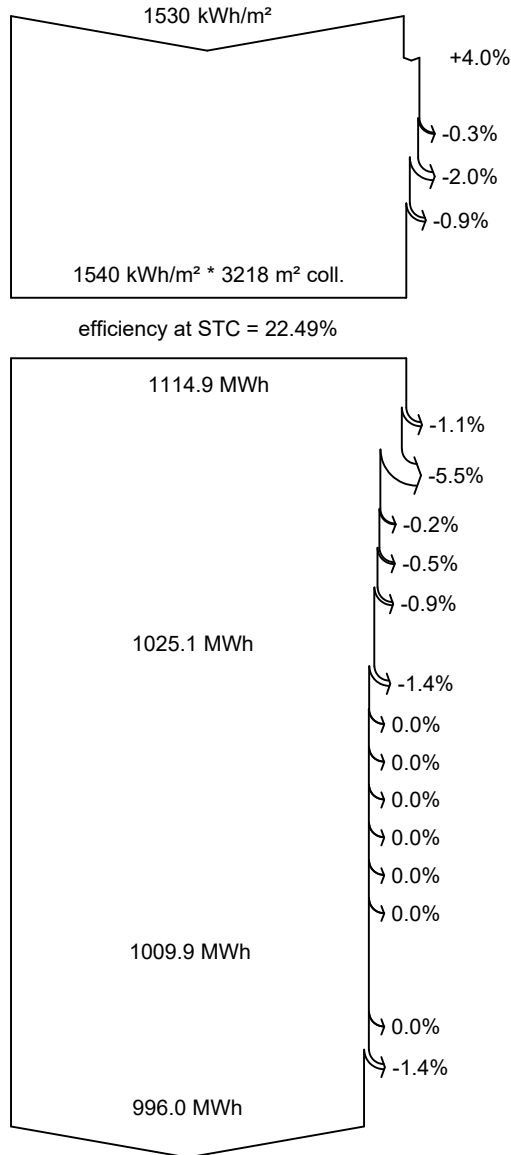
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	MWh	MWh	ratio
January	77.0	50.2	14.10	85.1	82.2	57.1	56.2	0.912
February	104.5	58.5	18.53	114.4	110.9	75.7	74.6	0.902
March	158.2	76.8	24.24	168.3	163.2	108.6	107.1	0.879
April	172.0	90.3	29.83	176.2	170.8	111.5	105.3	0.826
May	179.6	102.3	32.44	179.2	173.6	112.7	111.1	0.857
June	151.4	95.6	31.92	149.6	144.8	94.5	93.0	0.860
July	137.6	91.7	29.86	136.2	131.6	87.0	85.7	0.870
August	134.6	96.1	29.44	135.1	130.5	86.5	85.3	0.873
September	129.5	72.9	28.47	134.5	130.0	85.9	78.2	0.804
October	112.8	71.8	26.25	120.0	116.1	77.4	76.2	0.878
November	90.8	58.0	20.63	100.2	96.9	65.9	62.2	0.859
December	82.3	51.6	15.81	92.9	89.7	62.0	61.1	0.910
Year	1530.2	915.9	25.15	1591.6	1540.2	1024.7	996.0	0.865

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



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

Soiling loss factor

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

LID - Light induced degradation

Module array mismatch loss

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

AC ohmic loss

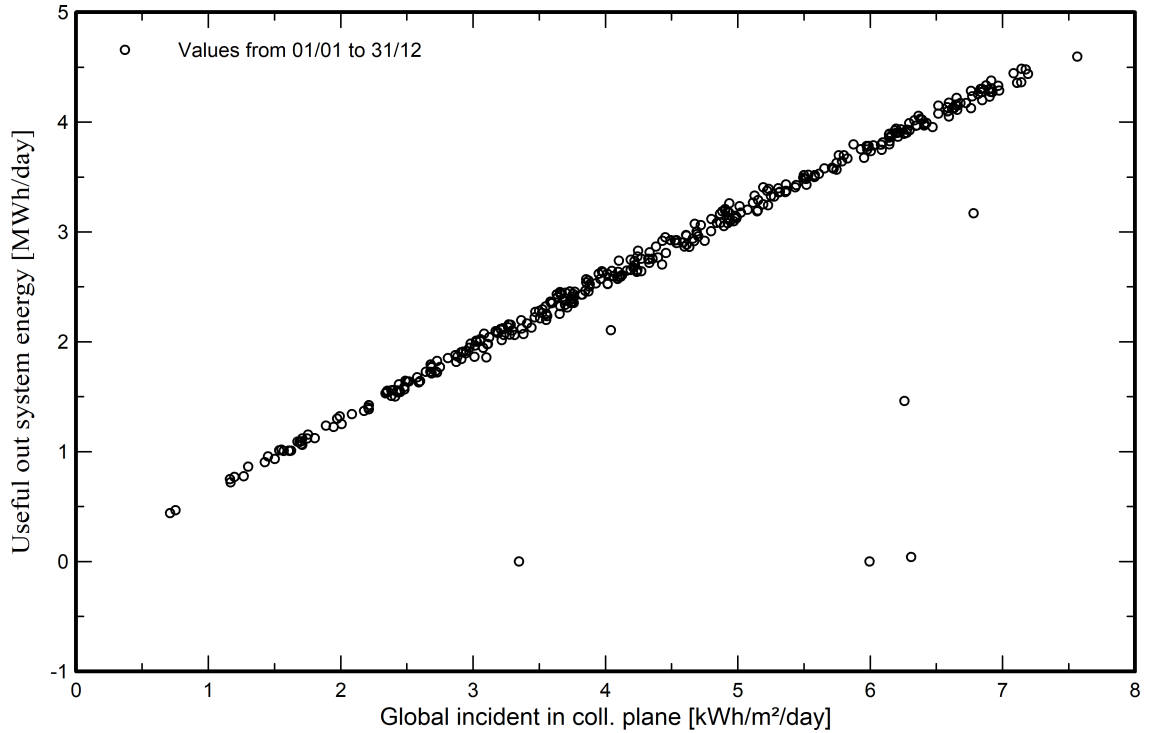
System unavailability

Energy injected into grid

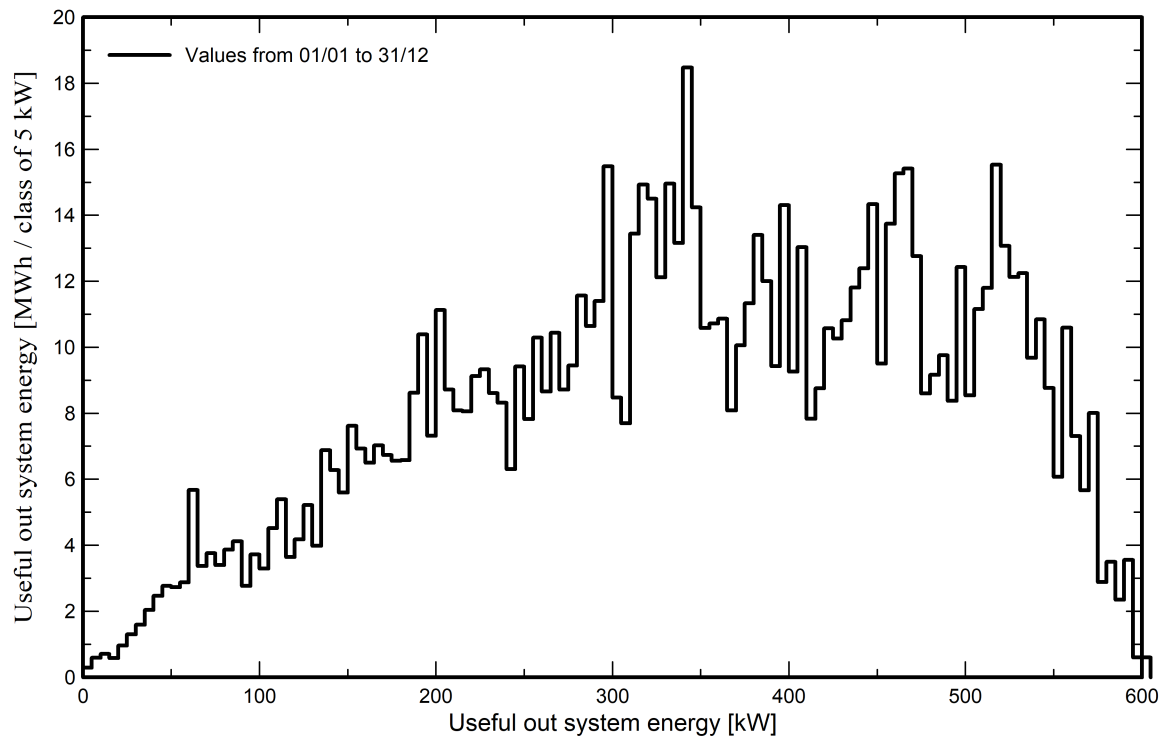


Predef. graphs

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 %

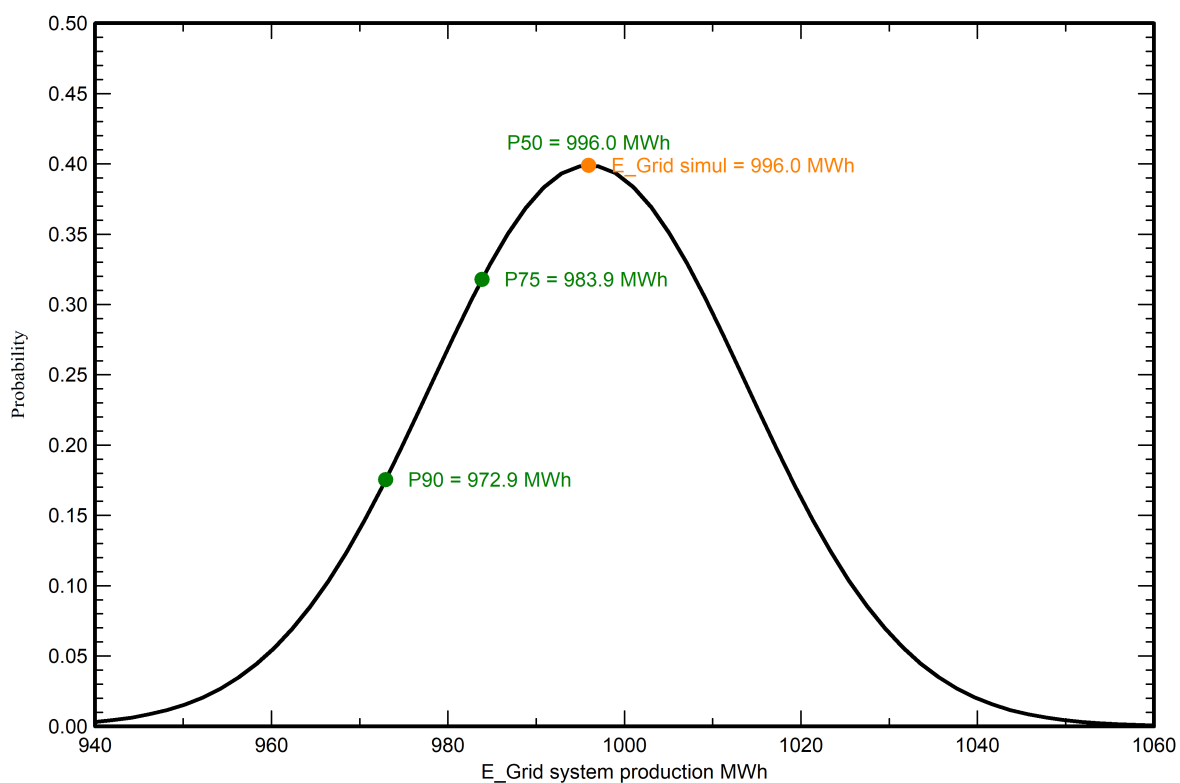
Simulation and parameters uncertainties

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 18.0 MWh
P50 996.0 MWh
P90 972.9 MWh
P75 983.9 MWh

Probability distribution





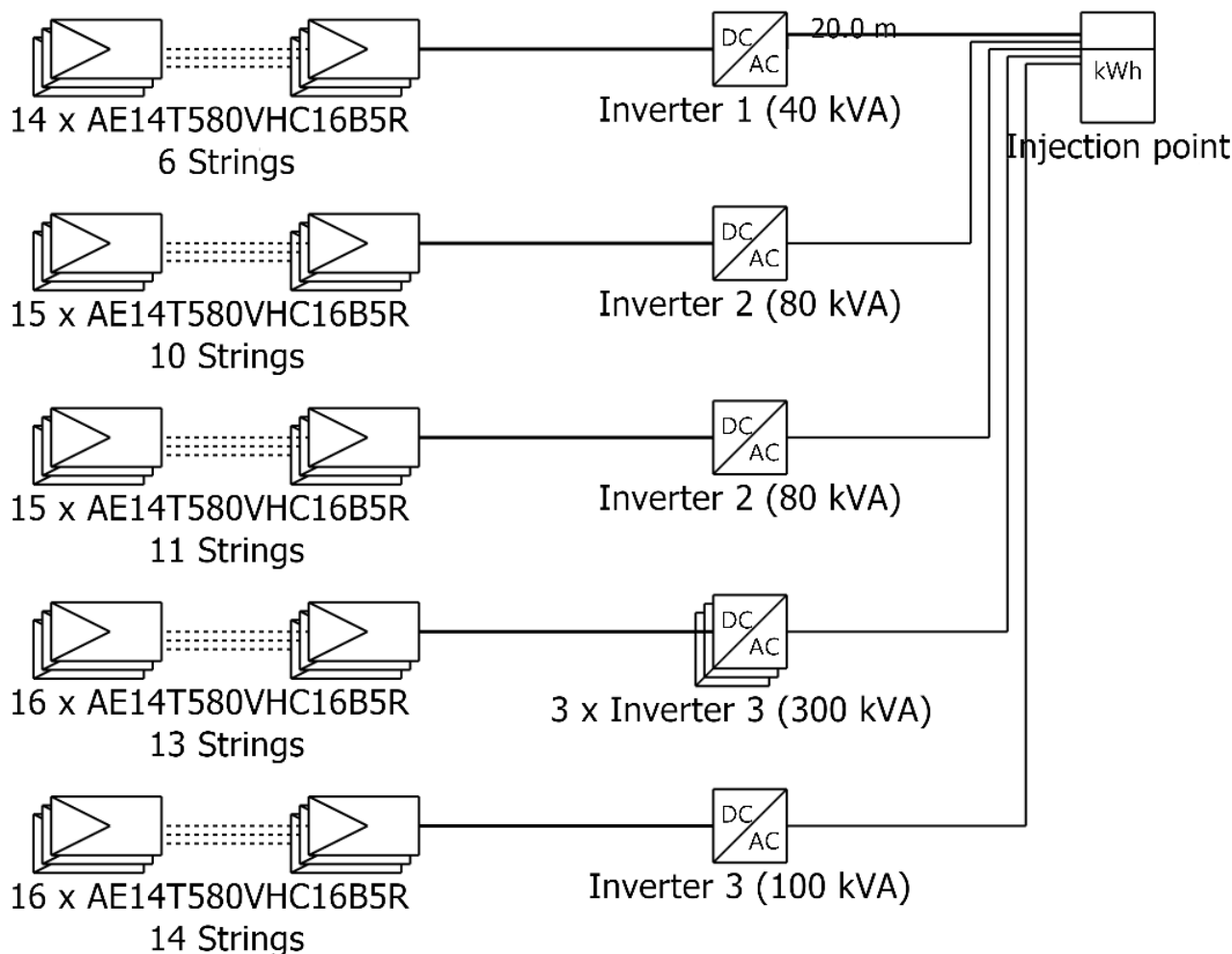
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Single-line diagram



PV module	AE14T580VHC16B5R
Inverter 1	MID 40KTL3-X
Inverter 2	MAX 80KTL3 LV
Inverter 3	MAX 100KTL3-X LV
String 1	14 x AE14T580VHC16B5R
String 2	15 x AE14T580VHC16B5R
String 3	16 x AE14T580VHC16B5R

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