

# PVsyst - Simulation report

## Grid-Connected System

---

Project: District male hospital sultanpur

Variant: New simulation variant

Unlimited sheds

System power: 298 kWp

Khallābād - India

**Author**

Jakson Limited (India)



# Project: District male hospital sultanpur

Variant: New simulation variant

## PVsyst V8.0.2

VC0, Simulation date:  
17/12/24 10:05  
with V8.0.2

Jakson Limited (India)

### Project summary

#### Geographical Site

**Khallābād**

India

#### Situation

Latitude 26.26 °N

Longitude 82.07 °E

Altitude 99 m

Time zone UTC+5.5

#### Project settings

Albedo 0.20

#### Weather data

Khallābād

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

### System summary

#### Grid-Connected System

#### Orientation #1

##### Sheds

Tilt 10 °

Azimuth 40 °

#### Unlimited sheds

#### Near Shadings

Mutual shadings of sheds

#### User's needs

Unlimited load (grid)

#### System information

##### PV Array

Nb. of modules

513 units

Pnom total

298 kWp

##### Inverters

Nb. of units

6 units

Pnom total

260 kWac

Pnom ratio

1.144

### Results summary

Produced Energy 430406 kWh/year Specific production 1447 kWh/kWp/year Perf. Ratio PR 92.51 %

### Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	7
Loss diagram	8
Predef. graphs	9
P50 - P90 evaluation	10



## PVsyst V8.0.2

VC0, Simulation date:  
17/12/24 10:05  
with V8.0.2

Jakson Limited (India)

## General parameters

## Grid-Connected System

## Unlimited sheds

## Orientation #1

## Sheds

Tilt	10 °
Azimuth	40 °

## 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

## 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
-------	--------------------------

## Bifacial model geometry

Sheds spacing	6.40 m
Sheds width	3.04 m
Limit profile angle	8.7 °
GCR	47.5 %
Height above ground	1.00 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 %

## 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	75 units
Nominal (STC)	43.5 kWp
Modules	5 string x 15 In series

## At operating cond. (50°C)

Pmpp	40.3 kWp
U mpp	616 V
I mpp	65 A

## Inverter

Manufacturer	Growatt New Energy
Model	MID 20KTL3-X

(Original PVsyst database)

Unit Nom. Power	20.0 kWac
Number of inverters	2 units
Total power	40.0 kWac
Operating voltage	160-1000 V
Pnom ratio (DC:AC)	1.09
Power sharing within this inverter	



## PVsyst V8.0.2

VC0, Simulation date:  
17/12/24 10:05  
with V8.0.2

Jakson Limited (India)

## 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 modules60 units  
Nominal (STC)34.8 kWp  
Modules4 string x 15 In series

## At operating cond. (50°C)

Pmpp32.3 kWp  
U mpp616 V  
I mpp52 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 modules80 units  
Nominal (STC)46.4 kWp  
Modules5 string x 16 In series

## At operating cond. (50°C)

Pmpp43.0 kWp  
U mpp657 V  
I mpp65 A

## Array #4 - Sub-array #4

## PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp  
Number of PV modules144 units  
Nominal (STC)83.5 kWp  
Modules9 string x 16 In series

## At operating cond. (50°C)

Pmpp77.4 kWp  
U mpp657 V  
I mpp118 A

## Array #5 - Sub-array #5

## PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp  
Number of PV modules154 units  
Nominal (STC)89.3 kWp  
Modules11 string x 14 In series

## At operating cond. (50°C)

Pmpp82.8 kWp  
U mpp575 V  
I mpp144 A

## Inverter

Manufacturer

Growatt New Energy

Model

MID 30KTL3-X

(Original PVsyst database)

Unit Nom. Power30.0 kWac  
Number of inverters1 unit  
Total power30.0 kWac  
Operating voltage200-1000 V  
Pnom ratio (DC:AC)1.16  
Power sharing within this inverter

## Inverter

Manufacturer

Growatt New Energy

Model

MID 40KTL3-X

(Original PVsyst database)

Unit Nom. Power40.0 kWac  
Number of inverters1 unit  
Total power40.0 kWac  
Operating voltage200-1000 V  
Pnom ratio (DC:AC)1.16  
Power sharing within this inverter

## Inverter

Manufacturer

Growatt New Energy

Model

MAX 70KTL3 LV

(Original PVsyst database)

Unit Nom. Power70.0 kWac  
Number of inverters1 unit  
Total power70.0 kWac  
Operating voltage200-1000 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. Power80.0 kWac  
Number of inverters1 unit  
Total power80.0 kWac  
Operating voltage200-1000 V  
Pnom ratio (DC:AC)1.12  
Power sharing within this inverter



## PV Array Characteristics

## Total PV power

Nominal (STC)	298 kWp
Total	513 modules
Module area	1324 m <sup>2</sup>

## Total inverter power

Total power	260 kWac
Number of inverters	6 units
Pnom ratio	1.14

## Array losses

## Array Soiling Losses

Loss Fraction	2.0 %
---------------	-------

## Thermal Loss factor

Module temperature according to irradiance	
Uc (const)	29.0 W/m <sup>2</sup> K
Uv (wind)	0.0 W/m <sup>2</sup> K/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
---------------	--------------

## Array #5 - Sub-array #5

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.	153 mΩ
Loss Fraction	1.5 % at STC

## Array #3 - Sub-array #3

Global array res.	163 mΩ
Loss Fraction	1.5 % at STC

## Array #5 - Sub-array #5

Global array res.	65 mΩ
Loss Fraction	1.5 % at STC

## Array #2 - Sub-array #2

Global array res.	192 mΩ
Loss Fraction	1.5 % at STC

## Array #4 - Sub-array #4

Global array res.	91 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 0.05 % at STC

#### Inverters: MID 20KTL3-X, MAX 70KTL3 LV

Wire section (3 Inv.) Copper 3 x 3 x 35 mm<sup>2</sup>  
Average wires length 30 m

#### Inverter: MID 40KTL3-X

Wire section (1 Inv.) Copper 1 x 3 x 16 mm<sup>2</sup>  
Wires length 0 m

#### Inverter: MID 30KTL3-X

Wire section (1 Inv.) Copper 1 x 3 x 10 mm<sup>2</sup>  
Wires length 0 m

#### Inverter: MAX 80KTL3 LV

Wire section (1 Inv.) Copper 1 x 3 x 50 mm<sup>2</sup>  
Wires length 0 m



# Project: District male hospital sultanpur

Variant: New simulation variant

PVsyst V8.0.2

VC0, Simulation date:  
17/12/24 10:05  
with V8.0.2

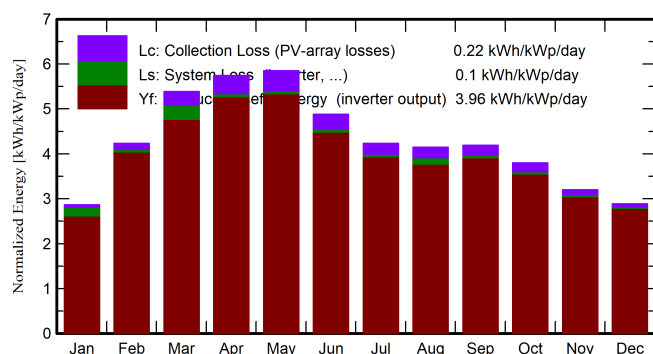
Jakson Limited (India)

## Main results

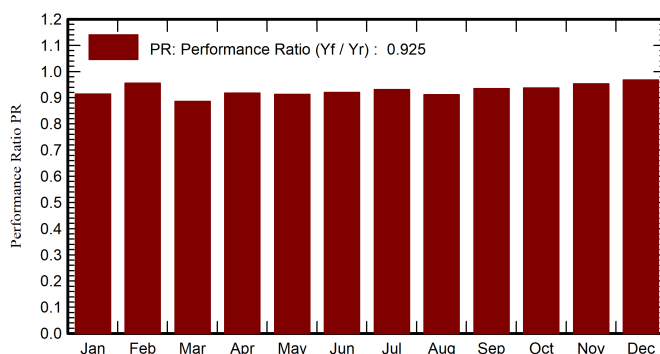
### System Production

Produced Energy (P50)	430406 kWh/year	Specific production (P50)	1447 kWh/kWp/year	Perf. Ratio PR	92.51 %
Produced Energy (P90)	420457 kWh/year	Specific production (P90)	1413 kWh/kWp/year		
Produced Energy (P75)	425175 kWh/year	Specific production (P75)	1429 kWh/kWp/year		

### Normalized productions (per installed kWp)



### Performance Ratio PR



## Balances and main results

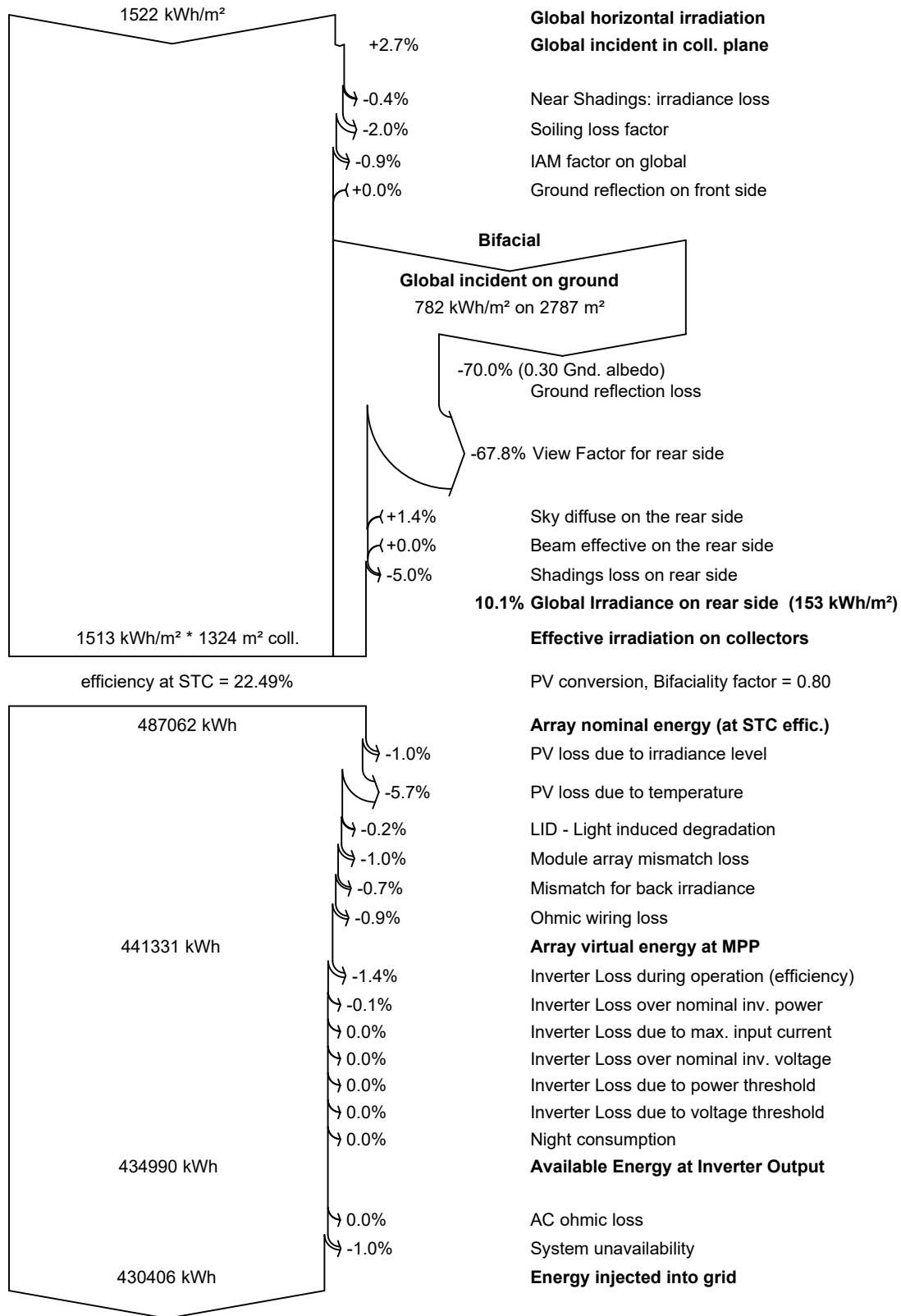
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	°C	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	kWh	kWh	ratio
January	82.3	51.1	14.87	88.9	85.8	26097	24175	0.914
February	110.5	59.0	19.43	118.6	114.8	34189	33717	0.956
March	159.5	72.9	25.36	167.1	162.1	46914	44080	0.886
April	169.7	86.4	30.52	172.4	167.1	47692	47053	0.917
May	182.7	100.1	33.35	181.3	175.8	49962	49274	0.913
June	148.6	95.4	32.41	146.5	141.8	40683	40095	0.920
July	132.3	87.5	30.22	131.2	126.9	36899	36360	0.931
August	128.5	83.6	29.66	128.5	124.2	36132	34859	0.912
September	123.0	78.4	28.66	125.8	121.6	35475	34971	0.934
October	112.4	71.5	26.83	117.7	113.8	33286	32808	0.937
November	89.6	58.2	21.39	96.1	92.8	27633	27240	0.953
December	82.7	53.6	16.74	89.6	86.3	26138	25773	0.967
Year	1521.9	897.9	25.81	1563.7	1513.0	441099	430406	0.925

### 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

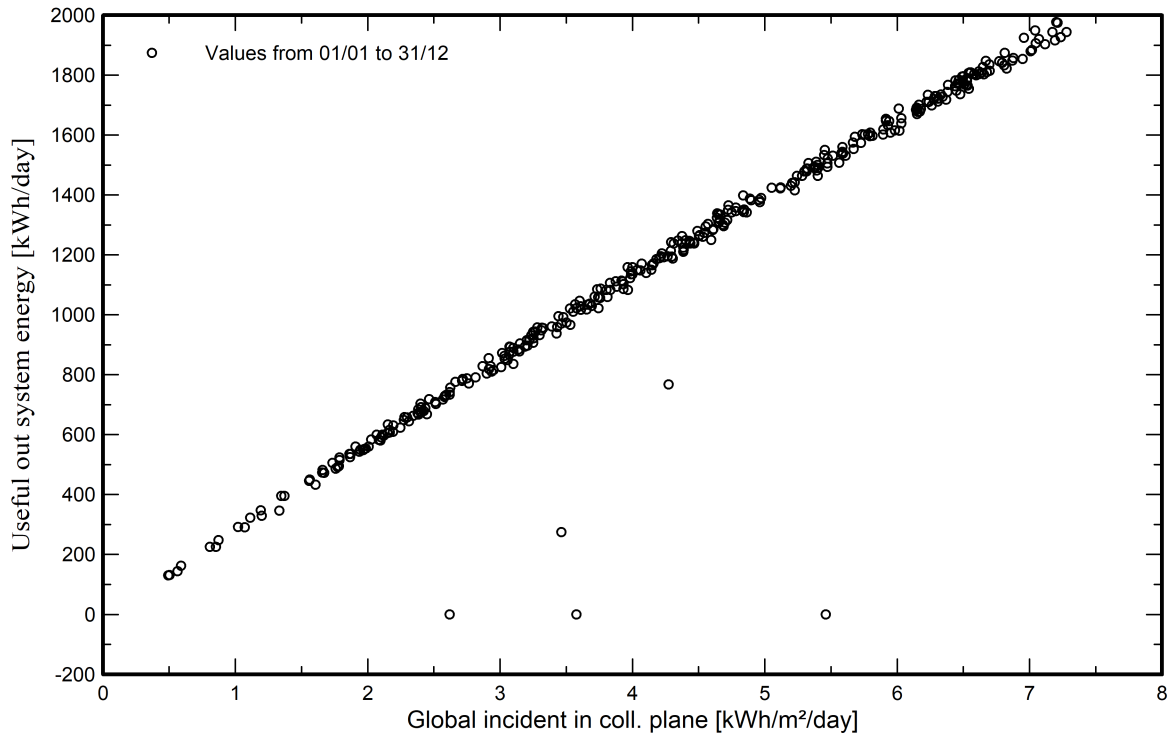




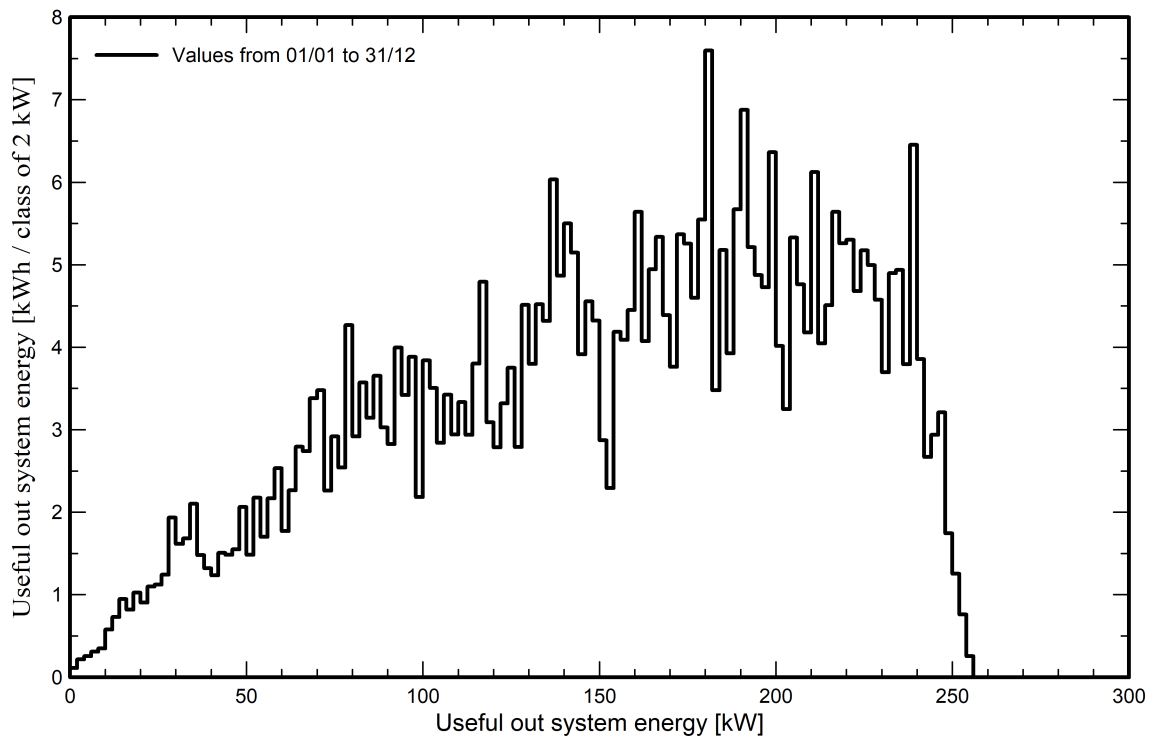


Predef. graphs

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 7.8 MWh  
P50 430.4 MWh  
P90 420.5 MWh  
P75 425.2 MWh

### Probability distribution

