REGIONE LAZIO

PROVINCIA di VITERBO

COMUNE di MONTALTO di CASTRO

Proponente

Alcione Rinnovabili srl

Largo Augusto n°3 - 20122 Milano (MI)

BayWa r.e.

Società controllata al 100% da BayWa r.e. Italia srl
Largo Augusto n°3 - 20122 Milano (MI)

Struttura di Progettazione e sviluppo

Coordinamento

PSEM 4.0

località Campomorto snc
01014 Montalto di Castro
Viterbo VT info@psem40.com

ANTONELLA FERRINI N. 711 Sez.'A'

SISTEMA ENERGIA REGRAN

Progettazione

IL PROGETTISTA
Ing. Marco Anfuso
DOTT. ING. MARCO ANFUSO N. 604
Ordine degli Ingegneri Ragusa

Firmato digitalmente da
marco anfuso
C = IT
Data e ora della firma:
25/05/2022 09:19:23

IL PROGETTISTA
Ing. Paolo Grande
Ing. Paolo GRANDE N. 652
Ordine degli Ingegneri Ragusa

grande paolo
Ordine degli Ingegneri della Provincia di Ragusa
Ingegnere
25.05.2022 14:45:24 GMT+00:00

R.C. Ing. Alessandro Cappello

Collaboratori
Dott. Ing. Salvatore Falla
Dott. Arch. Mirko Pasqualino Re
Dott. Ing. Valentino Otupacca

Opera

Progetto QUERCIOLARE

progetto di impianto fv a terra di potenza pari a 77,69 MW in DC e 65 MW in AC e delle opere connesse da installarsi nel territorio del comune di Montalto di Castro -VT-

Oggetto

Folder: VIA_2

Sez. R

Nome Elaborato: VIA2_REL07_Stima Producibilità ed emissioni in atmosfera

Codice Elaborato: REL_07

Descrizione Elaborato: Relazione di producibilità impianto

00	Aprile 2022	Emissione per progetto definitivo	Regran/Psem40	Sunwin	Alcione Rinnovabili
Rev.	Data	Oggetto della revisione	Elaborazione	Verifica	Approvazione

Scala: -

Formato: A4

Version 7.1.8

PVsyst - Simulation report

Grid-Connected System

Project: Querciolare

Variant: TSM660W_78MW_215KTL_H3_rev05

Ground system (tables) on a hill

System power: 77.87 MWp

Querciolare - Italy

Author

BayWa r.e AG. (Deutschland)

PVsyst V7.1.8
VC5, Simulation date:
12/11/21 19:16
with v7.1.8

Project summary

Geographical Site
Querciolare
Italy

Situation

Latitude	42.43 °N
Longitude	11.51 °E
Altitude	54 m
Time zone	UTC+1

Project settings
Albedo 0.20

Meteo data
Querciolare
MN8_SolarGIS - Synthetic

System summary

Grid-Connected System
Ground system (tables) on a hill

PV Field Orientation
Fixed plane
Tilt/Azimuth 20 / 14 °

Near Shadings
According to strings
Electrical effect 100 %

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	117992 units
Pnom total	77.87 MWp

Inverters

Nb. of units	301 units
Pnom total	60.20 MWac
Pnom ratio	1.294

Results summary

Produced Energy	117483 MWh/year	Specific production	1509 kWh/kWp/year	Perf. Ratio PR	85.98 %

Table of contents

PVsyst V7.1.8
VC5, Simulation date:
12/11/21 19:16
with v7.1.8

General parameters

Grid-Connected System

Ground system (tables) on a hill

PV Field Orientation

Orientation	
Fixed plane	
Tilt/Azimuth	20 / 14 °

Sheds configuration	
Nb. of sheds	2109 units
Sizes	
Sheds spacing	7.39 m
Collector width	4.79 m
Ground Cov. Ratio (GCR)	64.8 %
Shading limit angle	
Limit profile angle	29.7 °

Models used	
Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon
Average Height 2.0 °

Near Shadings
According to strings
Electrical effect 100 %

User's needs
Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Trina Solar
Model	TSM-660DEG21C.20
(Custom parameters definition)	
Unit Nom. Power	660 Wp
Number of PV modules	117992 units
Nominal (STC)	77.87 MWp
Modules	4214 Strings x 28 In series
At operating cond. (50°C)	
Pmpp	71.44 MWp
U mpp	962 V
I mpp	74272 A

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-215KTL-H3-Preliminary V0.4-20201126
(Custom parameters definition)	
Unit Nom. Power	200 kWac
Number of inverters	301 units
Total power	60200 kWac
Operating voltage	500-1500 V
Max. power (=>33°C)	200 kWac
Pnom ratio (DC:AC)	1.29

Total PV power

Nominal (STC)	77875 kWp
Total	117992 modules
Module area	366525 m²
Cell area	343428 m²

Total inverter power

Total power	60200 kWac
Nb. of inverters	301 units
Pnom ratio	1.29

Array losses

Array Soiling Losses
Loss Fraction 1.0 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

DC wiring losses
Global array res. 0.14 mΩ
Loss Fraction 1.0 % at STC

Module Quality Loss
Loss Fraction -0.3 %

Module mismatch losses
Loss Fraction 0.5 % at MPP

Strings Mismatch loss
Loss Fraction 0.1 %

IAM loss factor
Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.958	0.938	0.856	0.777	0.000

PVsyst V7.1.8
VC5, Simulation date:
12/11/21 19:16
with v7.1.8

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage	800	Vac tri
Loss Fraction	1.0	% at STC

Inverter: SUN2000-215KTL-H3-Preliminary V0.4-20201126

Wire section (301 Inv.)	Copper 301 x 3 x 70	mm²
Average wires length	94	m

MV line up to Injection

MV Voltage	33	kV
Wires	Copper 3 x 1500	mm²
Length	5650	m
Loss Fraction	0.5	% at STC

AC losses in transformers

MV transfo

Grid Voltage	33	kV

Operating losses at STC

Nominal power at STC (PNomac)	76394	kVA
Iron loss (night disconnect)	61.12	kW
Loss Fraction	0.1	% at STC
Coils equivalent resistance	3 x 0.07	mΩ
Loss Fraction	0.8	% at STC

PVsyst V7.1.8
VC5, Simulation date:
12/11/21 19:16
with v7.1.8

Horizon definition

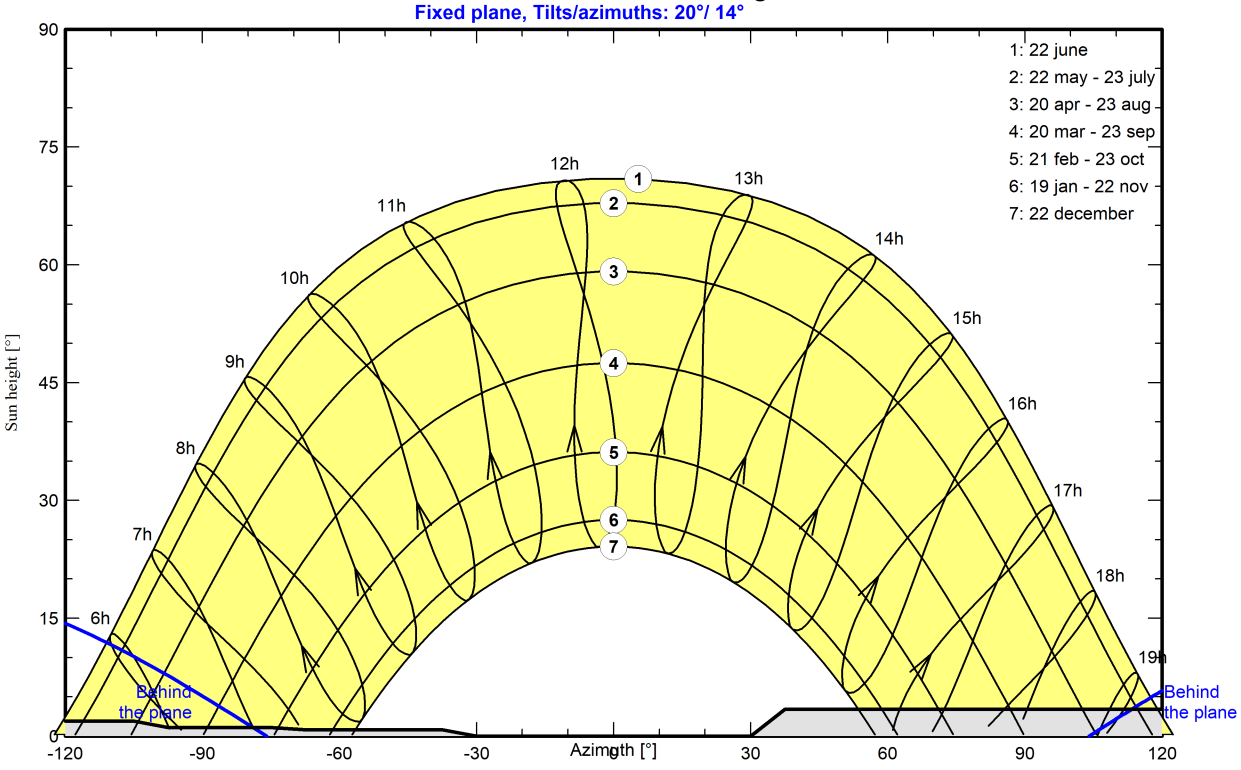
Average Height	2.0 °	Albedo Factor	0.95
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-150	-143	-135	-105	-98	-75	-68
Height [°]	3.1	2.3	2.3	3.1	1.9	2.3	1.9	1.9	1.1	1.1	0.8
Azimuth [°]	-38	-30	30	38	143	150	158	165	173	180	
Height [°]	0.8	0.0	0.0	3.4	3.4	3.1	3.1	2.3	3.4	3.1	

Sun Paths (Height / Azimuth diagram)

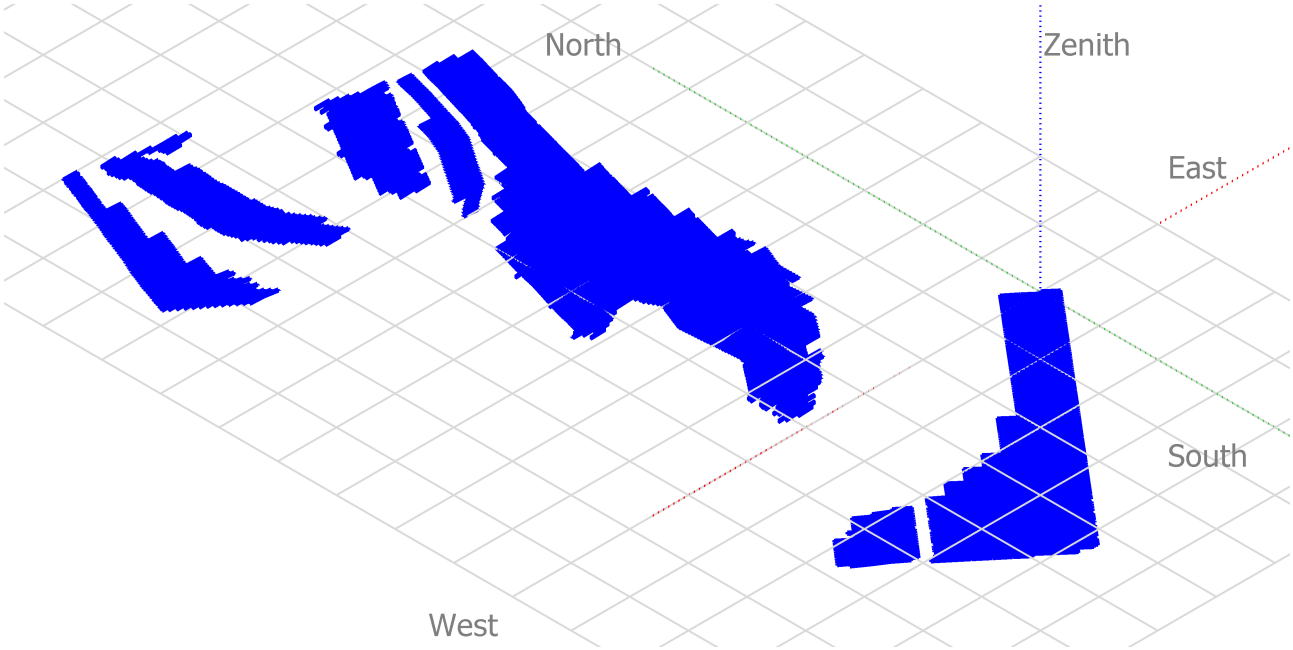
Horizon from PVGIS website API, Lat=42°25"33', Long=11°30"43', Alt=54m
Fixed plane, Tilts/azimuths: 20°/ 14°



PVsyst V7.1.8
VC5, Simulation date:
12/11/21 19:16
with v7.1.8

Near shadings parameter

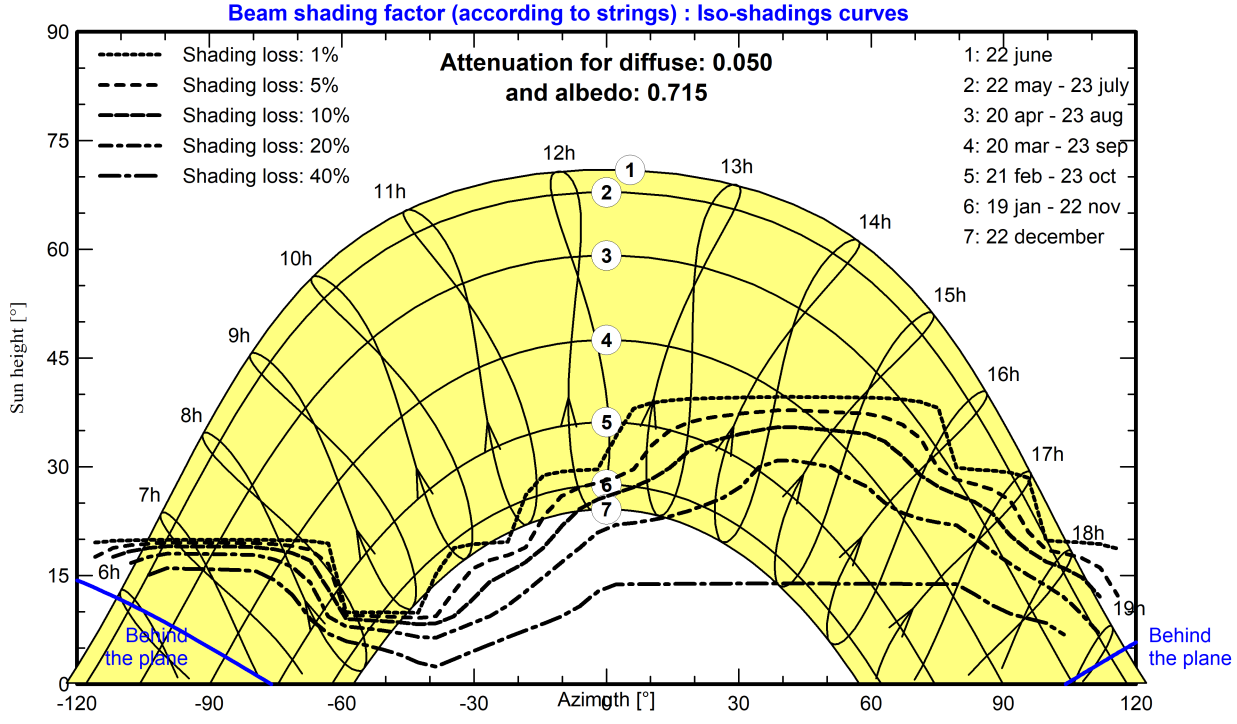
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Querciolare

Beam shading factor (according to strings) : Iso-shadings curves

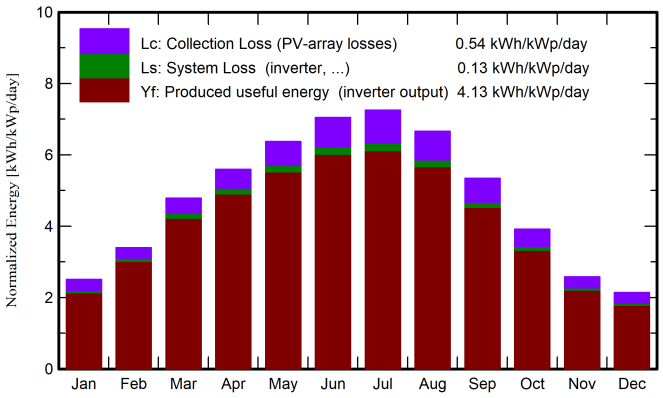


Main results

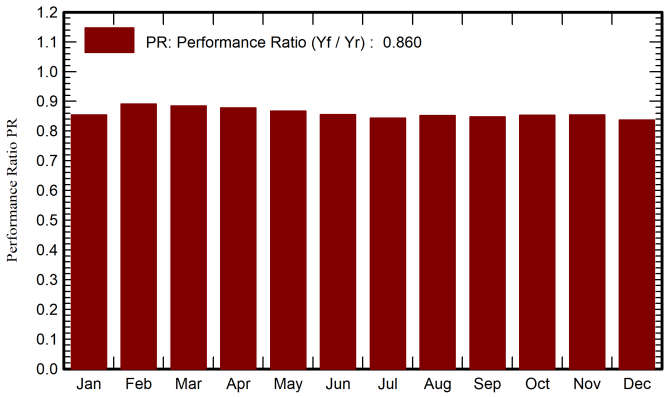
System Production

Produced Energy	117483 MWh/year	Specific production	1509 kWh/kWp/year
		Performance Ratio PR	85.98 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

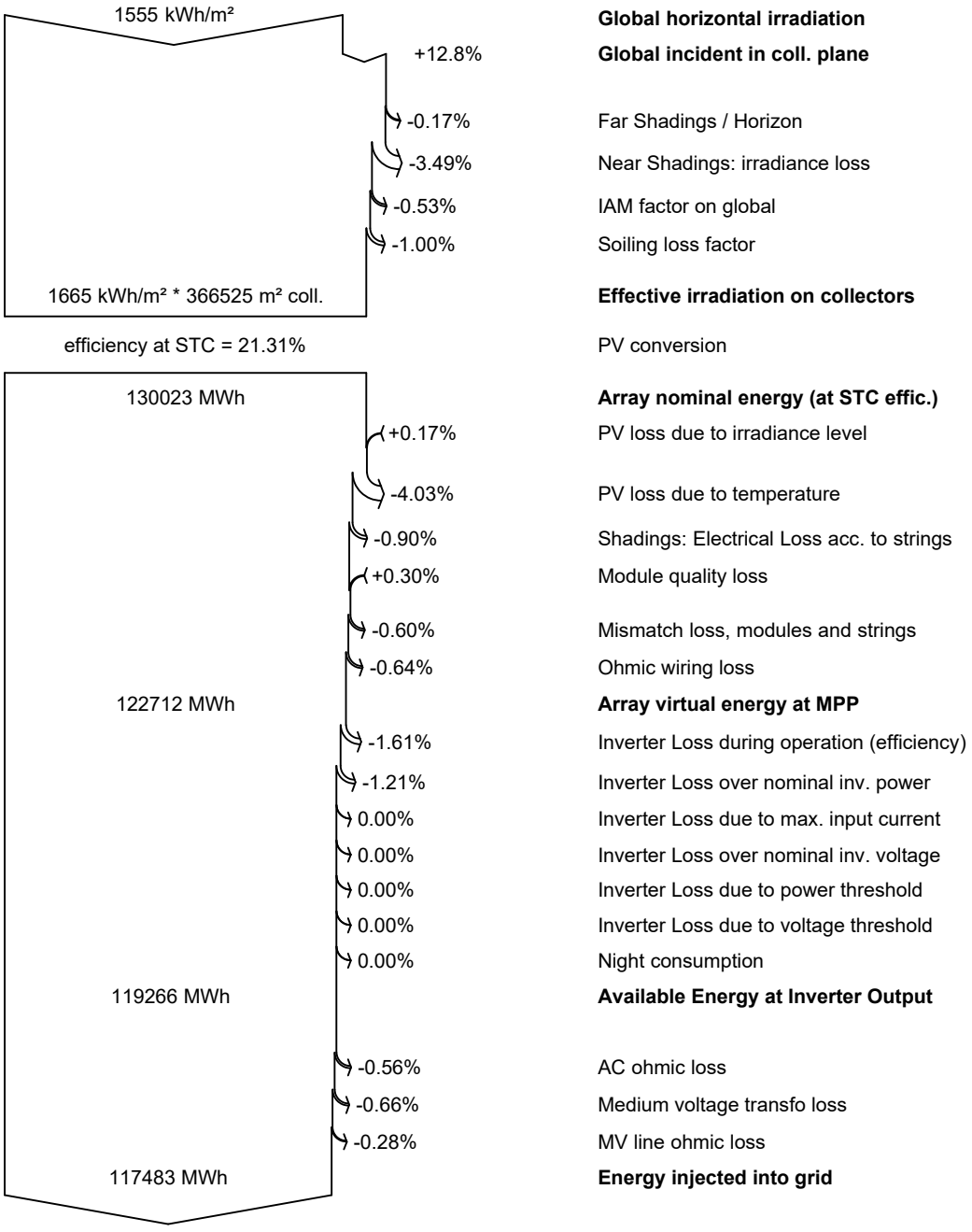
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	53.5	25.60	8.29	77.6	69.6	5306	5162	0.854
February	71.9	32.80	8.90	95.0	89.0	6786	6591	0.891
March	123.5	52.80	11.44	148.4	140.3	10546	10222	0.885
April	152.6	65.80	14.43	167.8	160.9	11842	11474	0.878
May	193.8	79.30	18.37	197.6	190.2	13789	13353	0.868
June	212.2	78.80	22.70	211.3	204.0	14554	14081	0.856
July	221.6	75.20	25.23	224.9	217.2	15279	14773	0.844
August	192.2	67.80	25.26	206.6	199.0	14161	13701	0.852
September	137.3	54.30	21.32	160.3	152.3	10934	10587	0.848
October	96.0	44.60	17.64	121.3	113.1	8301	8056	0.853
November	55.5	26.90	13.25	77.5	70.6	5304	5156	0.854
December	45.2	24.00	9.50	66.4	58.6	4444	4328	0.837
Year	1555.3	627.90	16.40	1754.7	1664.8	121247	117483	0.860

Legends

GlobHor	Global horizontal irradiation
DiffHor	Horizontal diffuse irradiation
T_Amb	Ambient Temperature
GlobInc	Global incident in coll. plane
GlobEff	Effective Global, corr. for IAM and shadings
EArray	Effective energy at the output of the array
E_Grid	Energy injected into grid
PR	Performance Ratio

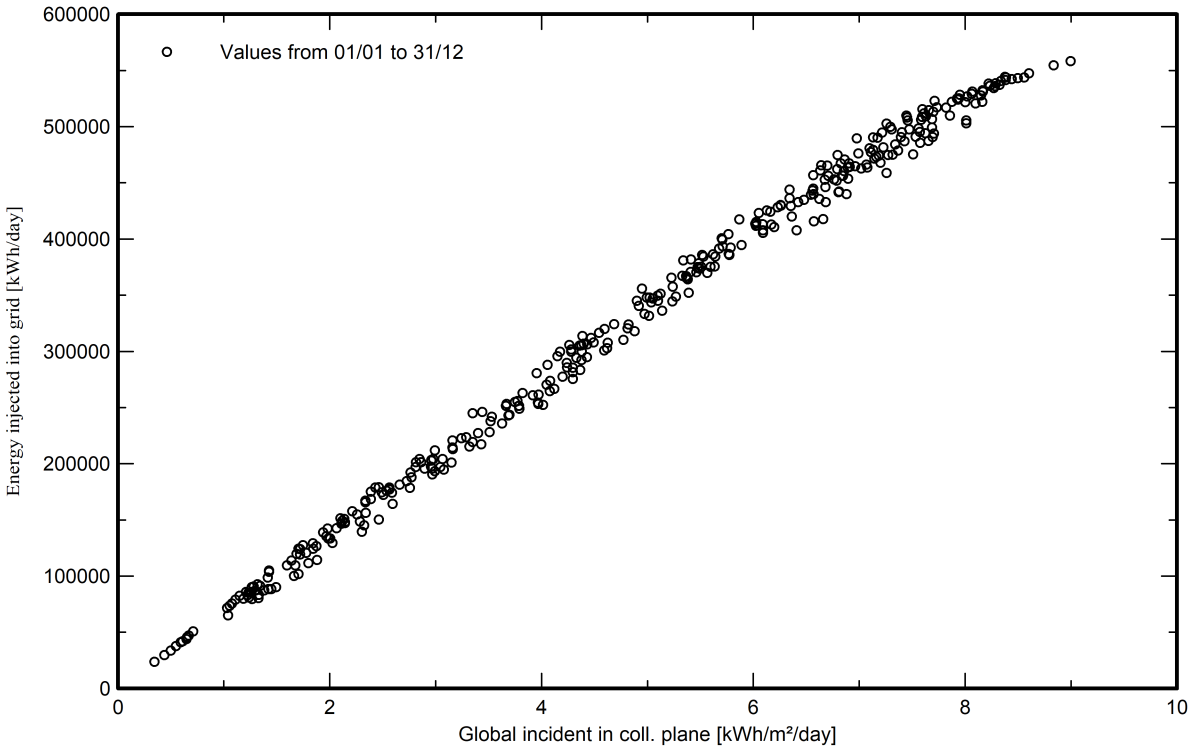
PVsyst V7.1.8
VC5, Simulation date:
12/11/21 19:16
with v7.1.8

Loss diagram



Special graphs

Daily Input/Output diagram



System Output Power Distribution