Version 7.3.4

PVsyst - Simulation report

Grid-Connected System

Project: PSFV VALDEMORO

Variant: Nueva variante de simulación

Tracking system

System power: 6006 kWp

Gózquez de Arriba - España

Autor(a)

GoBeCloud S.L (Spain)

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with v7.3.1

Project summary

Geographical Site
Gózquez de Arriba
España

Situation

Latitude	40.22 °N
Longitude	-3.64 °W
Altitude	629 m
Time zone	UTC+1

Project settings

Albedo	0.20

Meteo data
Gózquez de Arriba
Meteonorm 8.1 (1996-2015), Sat=52% - Sintético

System summary

Grid-Connected System
Simulation for year no 10

Tracking system

PV Field Orientation
Orientation
Tracking plane, horizontal N-S axis
Avg axis azim. 0 °

Tracking algorithm
Astronomic calculation

Near Shadings
Linear shadings
Diffuse shading Automatic

System information

PV Array

Nb. of modules	9240 units
Pnom total	6006 kWp

Inverters

Nb. of units	17 units
Pnom total	4990 kWac
Grid power limit	4990 kWac
Grid lim. Pnom ratio	1.204

User's needs
Unlimited load (grid)

Results summary

Produced Energy	11778542 kWh/year	Specific production	1961 kWh/kWp/year	Perf. Ratio PR	79.07 %

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General parameters

Grid-Connected System

Tracking system

PV Field Orientation

Orientation
Tracking plane, horizontal N-S axis
Avg axis azim. 0 °

Tracking algorithm
Astronomic calculation

Trackers configuration
Nb. of trackers 308 units

Sizes
Tracker Spacing 6.00 m
Collector width 2.29 m
Ground Cov. Ratio (GCR) 38.2 %
Phi min / max. -/+ 55.0 °

Shading limit angles
Phi limits for BT -/+ 67.4 °

Models used
Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon
Average Height 1.8 °

Near Shadings
Linear shadings
Diffuse shading Automatic

User's needs
Unlimited load (grid)

Bifacial system
Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing	6.00 m
Tracker width	2.29 m
GCR	38.2 %
Axis height above ground	2.10 m

Bifacial model definitions

Ground albedo	0.30
Bifaciality factor	70 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

Grid power limitation
Active power 4990 kWac
Pnom ratio 1.204

PV Array Characteristics

Array #1 - Generador FV

PV module

Manufacturer	Trina Solar
Model	TSM-650DEG21C.20
(Custom parameters definition)	
Unit Nom. Power	650 Wp
Number of PV modules	8640 units
Nominal (STC)	5616 kWp
Modules	288 Strings x 30 In series
At operating cond. (50°C)	
Pmpp	5152 kWp
U mpp	1021 V
I mpp	5046 A

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-330KTL-H1-Preliminary V0.1
(Custom parameters definition)	
Unit Nom. Power	300 kWac
Number of inverters	16 units
Total power	4800 kWac
Operating voltage	500-1500 V
Max. power (=>30°C)	330 kWac
Pnom ratio (DC:AC)	1.17
Power sharing within this inverter	

PV Array Characteristics

Array #2 - Subconjunto #2

PV module

Manufacturer	Trina Solar
Model	TSM-650DEG21C.20
(Custom parameters definition)	
Unit Nom. Power	650 Wp
Number of PV modules	600 units
Nominal (STC)	390 kWp
Modules	20 Strings x 30 In series
At operating cond. (50°C)	
Pmpp	358 kWp
U mpp	1021 V
I mpp	350 A

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-330KTL-H1-Preliminary V0.1
(Custom parameters definition)	
Unit Nom. Power	190 kWac
Number of inverters	1 unit
Total power	190 kWac
Operating voltage	500-1500 V
Max. power (=>30°C)	330 kWac
Pnom ratio (DC:AC)	2.05
Power sharing within this inverter	

Total PV power

Nominal (STC)	6006 kWp
Total	9240 modules
Module area	28703 m²
Cell area	26894 m²

Total inverter power

Total power	4990 kWac
Max. power	5610 kWac
Number of inverters	17 units
Pnom ratio	1.20

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 1.5 %

Module Quality Loss
Loss Fraction -0.5 %

Module mismatch losses
Loss Fraction 1.1 % at MPP

Strings Mismatch loss
Loss Fraction 0.1 %

Module average degradation
Year no 10
Loss factor 0.5 %/year
Mismatch due to degradation
Imp RMS dispersion 0.4 %/year
Vmp RMS dispersion 0.4 %/year

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

0°	40°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.992	0.983	0.961	0.933	0.853	0.000

DC wiring losses

Global wiring resistance 3.3 mΩ
Loss Fraction 1.6 % at STC

Array #1 - Generador FV
Global array res. 3.5 mΩ
Loss Fraction 1.6 % at STC

Array #2 - Subconjunto #2
Global array res. 48 mΩ
Loss Fraction 1.5 % at STC

System losses

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System losses

Unavailability of the system
Time fraction 1.0 %
3.7 days,
3 periods

Auxiliaries loss
Proportionnal to Power 4.0 W/kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo
Inverter voltage 800 Vac tri
Loss Fraction 0.00 % at STC
Inverter: SUN2000-330KTL-H1-Preliminary V0.1
Wire section (17 Inv.) Copper 17 x 3 x 120 mm²
Average wires length 0 m

AC losses in transformers

MV transfo
Medium voltage 45 kV
Transformer parameters
Nominal power at STC 5.90 MVA
Iron Loss (24/24 Connexion) 5.78 kVA
Iron loss fraction 0.10 % at STC
Copper loss 54.27 kVA
Copper loss fraction 0.92 % at STC
Coils equivalent resistance 3 x 1.00 mΩ

Horizon definition

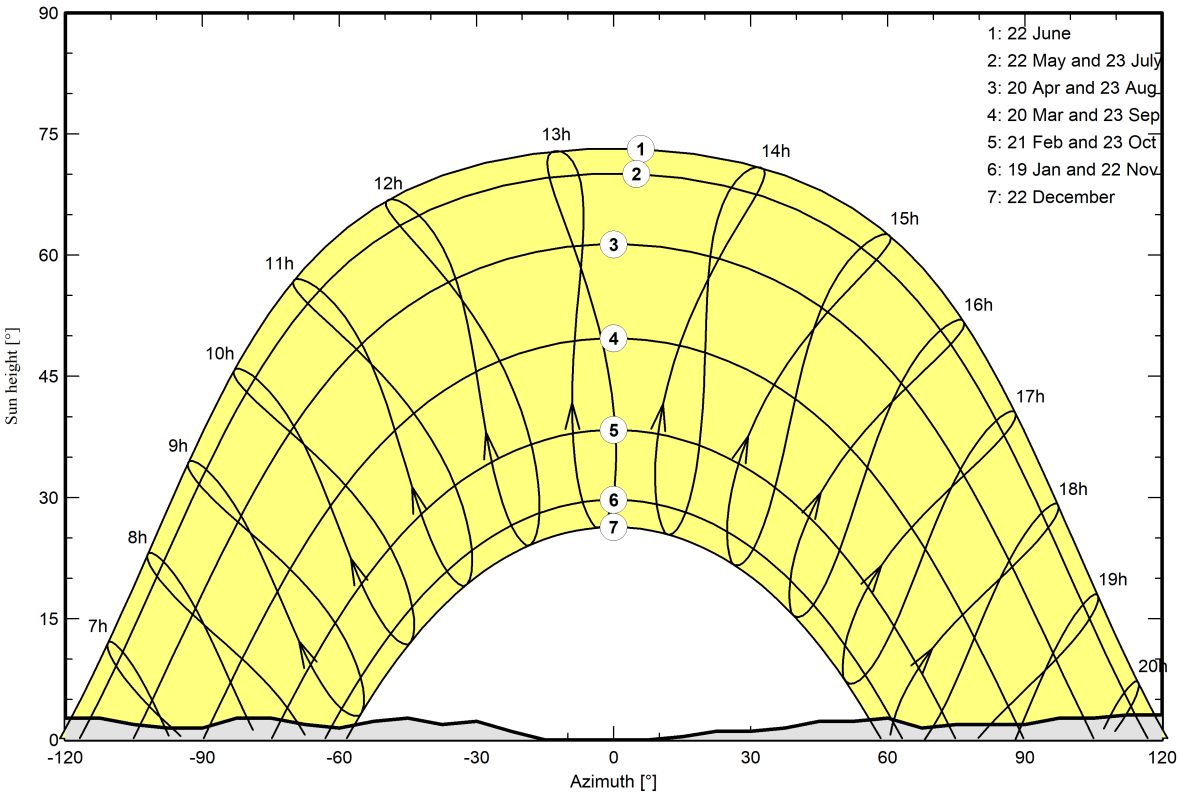
Horizon from PVGIS website API, Lat=40°12"54', Long=-3°38"23', Alt=629m

Average Height	1.8 °	Albedo Factor	0.89
Diffuse Factor	0.97	Albedo Fraction	100 %

Horizon profile

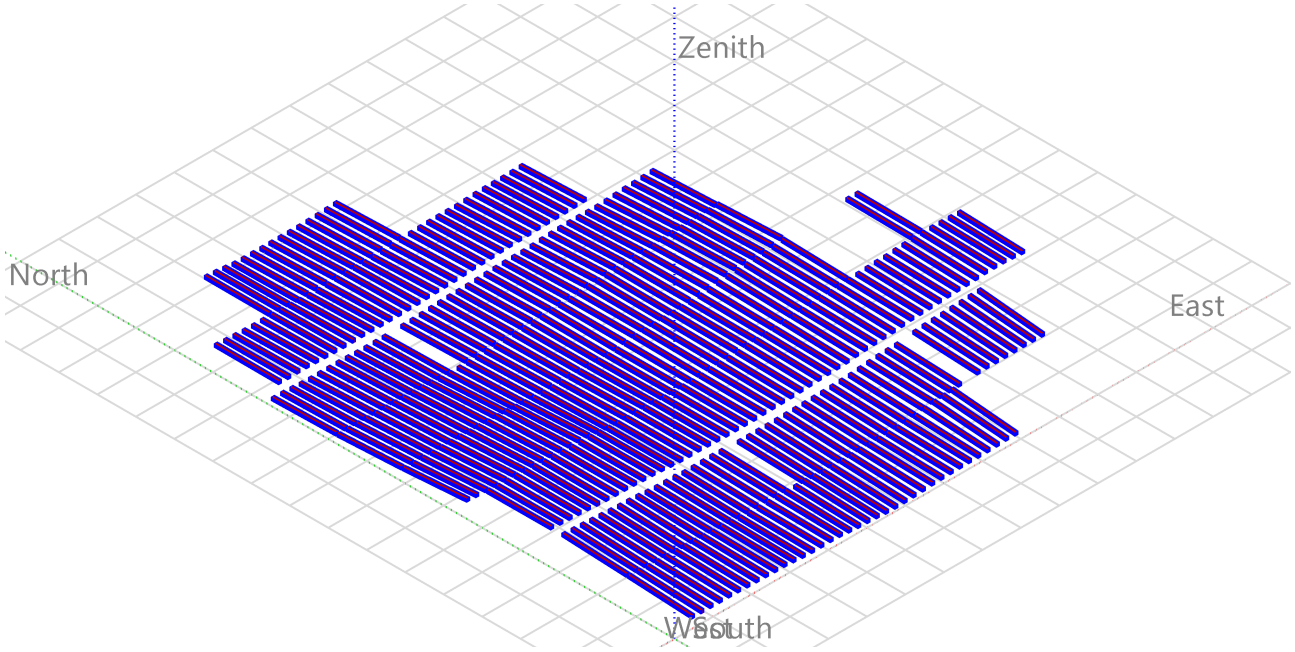
Azimuth [°]	-180	-173	-158	-150	-143	-135	-128	-120	-113	-105	-98	-90	-83	-75
Height [°]	0.4	0.4	1.1	1.9	1.9	3.1	3.4	2.7	2.7	1.9	1.5	1.5	2.7	2.7
Azimuth [°]	-68	-60	-53	-45	-38	-30	-23	-15	8	15	23	30	38	45
Height [°]	1.9	1.5	2.3	2.7	1.9	2.3	1.1	0.0	0.0	0.4	1.1	1.1	1.5	2.3
Azimuth [°]	53	60	68	75	90	98	105	113	135	143	158	165	173	180
Height [°]	2.3	2.7	1.5	1.9	1.9	2.7	2.7	3.1	3.1	1.5	1.5	0.8	0.4	0.4

Sun Paths (Height / Azimuth diagram)



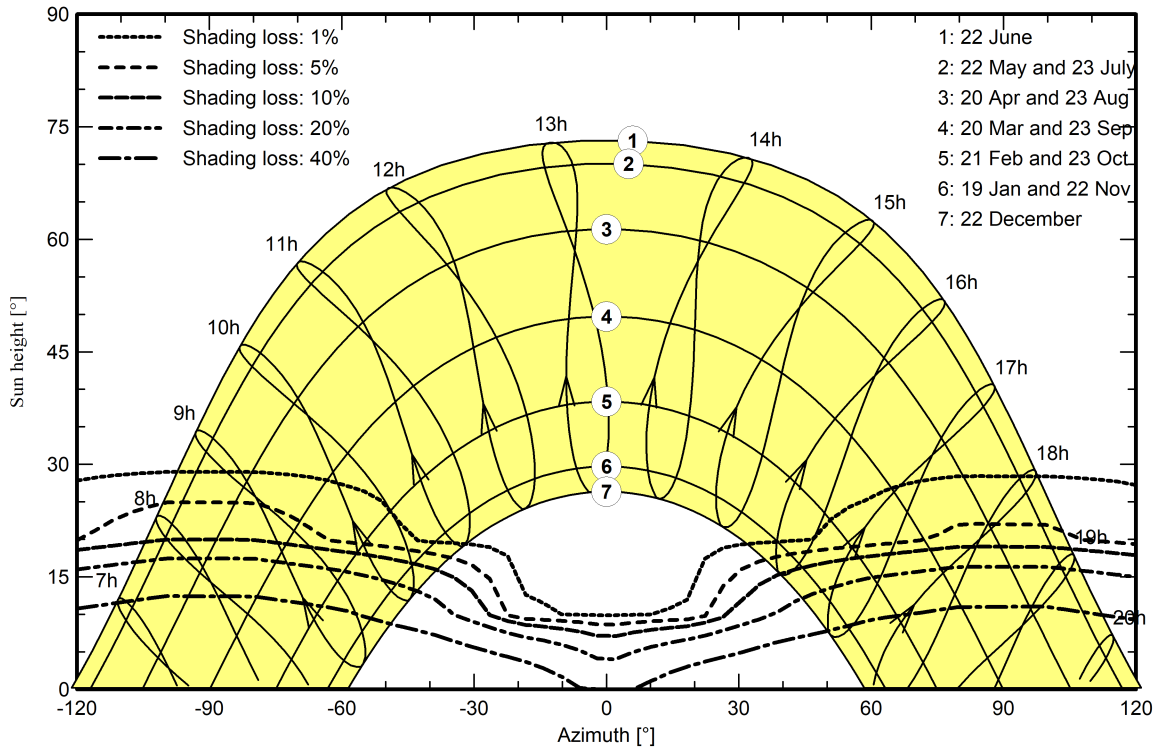
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1



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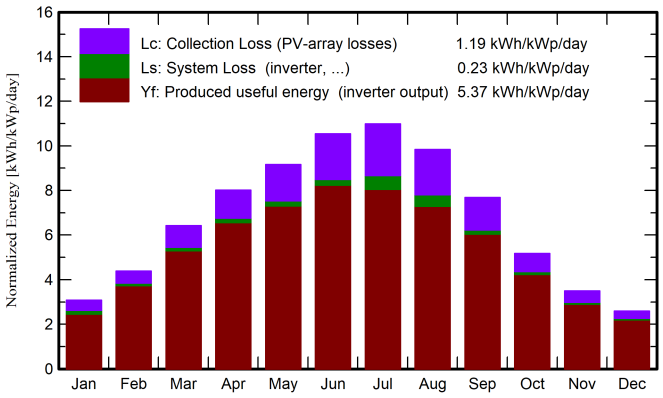
Main results

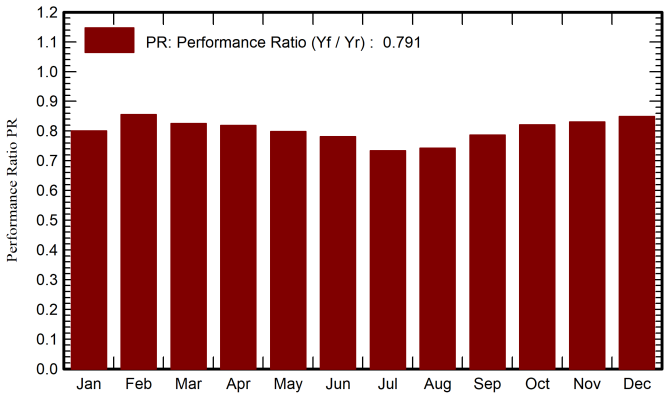
System Production

Produced Energy	11778542 kWh/year	Specific production	1961 kWh/kWp/year
		Perf. Ratio PR	79.07 %

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 kWh	E_Grid kWh	PR ratio
January	64.1	24.96	6.11	95.5	83.3	491228	459070	0.801
February	86.3	34.76	7.51	122.6	111.4	648144	629470	0.855
March	138.2	45.34	11.14	199.3	180.8	1017649	987800	0.825
April	172.8	57.34	13.86	240.7	221.5	1218996	1182960	0.818
May	204.8	72.37	18.75	283.9	260.7	1403566	1361809	0.799
June	226.5	63.90	24.39	316.5	292.2	1531190	1484613	0.781
July	240.3	59.12	27.83	340.7	315.5	1614731	1501430	0.734
August	211.4	55.29	27.25	305.0	280.2	1453923	1359050	0.742
September	157.8	48.57	22.14	230.6	209.5	1123069	1089216	0.786
October	111.6	45.99	16.68	160.2	144.8	813158	789587	0.821
November	71.8	30.49	9.86	105.0	92.8	539929	523756	0.831
December	55.7	23.66	6.65	80.4	71.4	423002	409782	0.849
Year	1741.3	561.78	16.07	2480.3	2264.1	12278586	11778542	0.791

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

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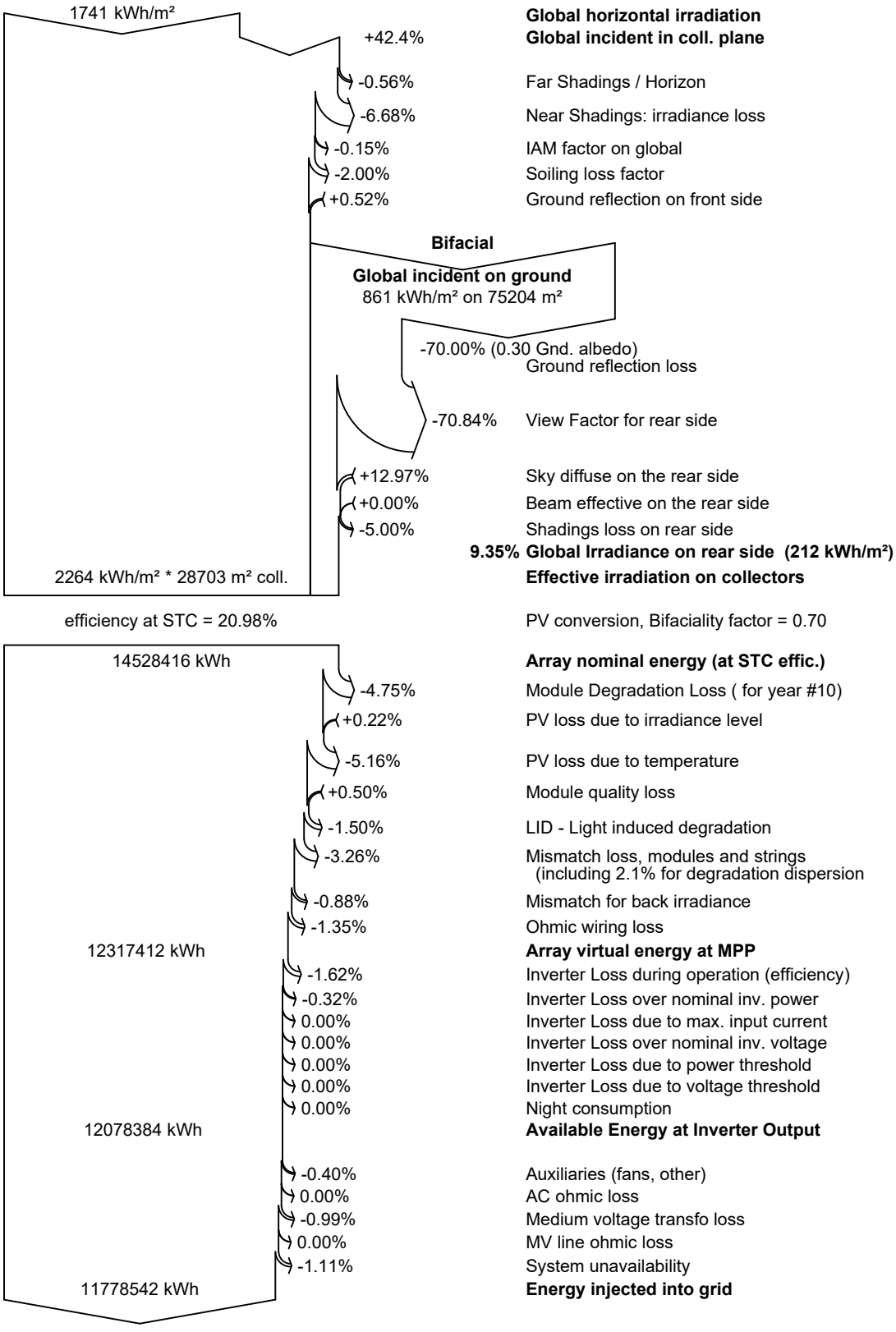
Loss diagram



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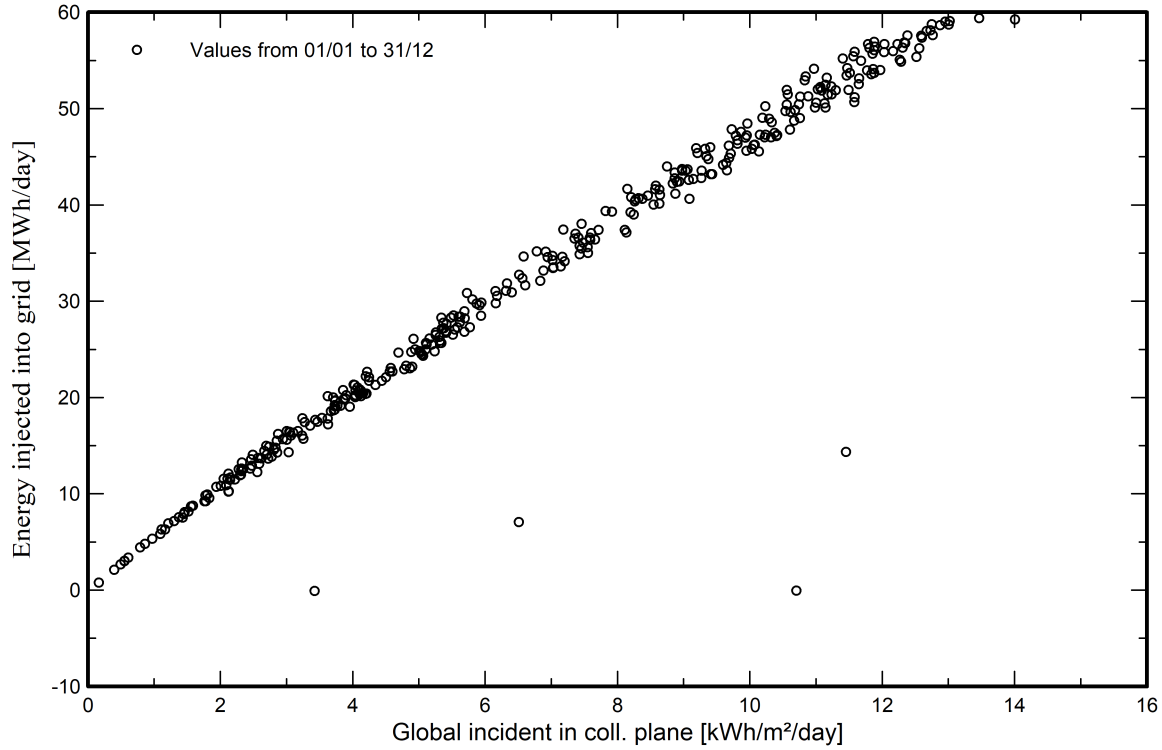
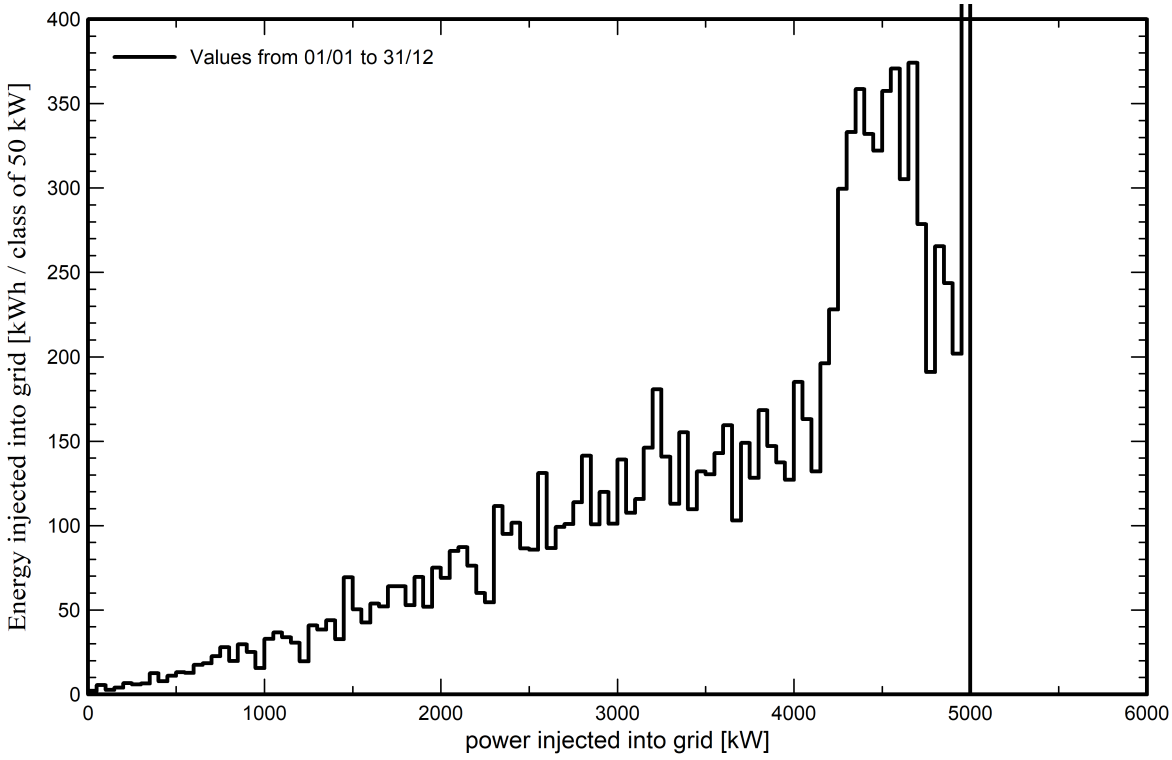
Predef. graphs

Diagrama entrada/salida diaria



Distribución de potencia de salida del sistema



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P50 - P90 evaluation

Meteo data

Source	Meteonorm 8.1 (1996-2015), Sat=52%
Kind	Monthly averages
Sintético - Multi-year average	
Year-to-year variability(Variance)	4.0 %

Specified Deviation

Climate change	0.0 %

Global variability (meteo + system)

Variability (Quadratic sum)	4.4 %

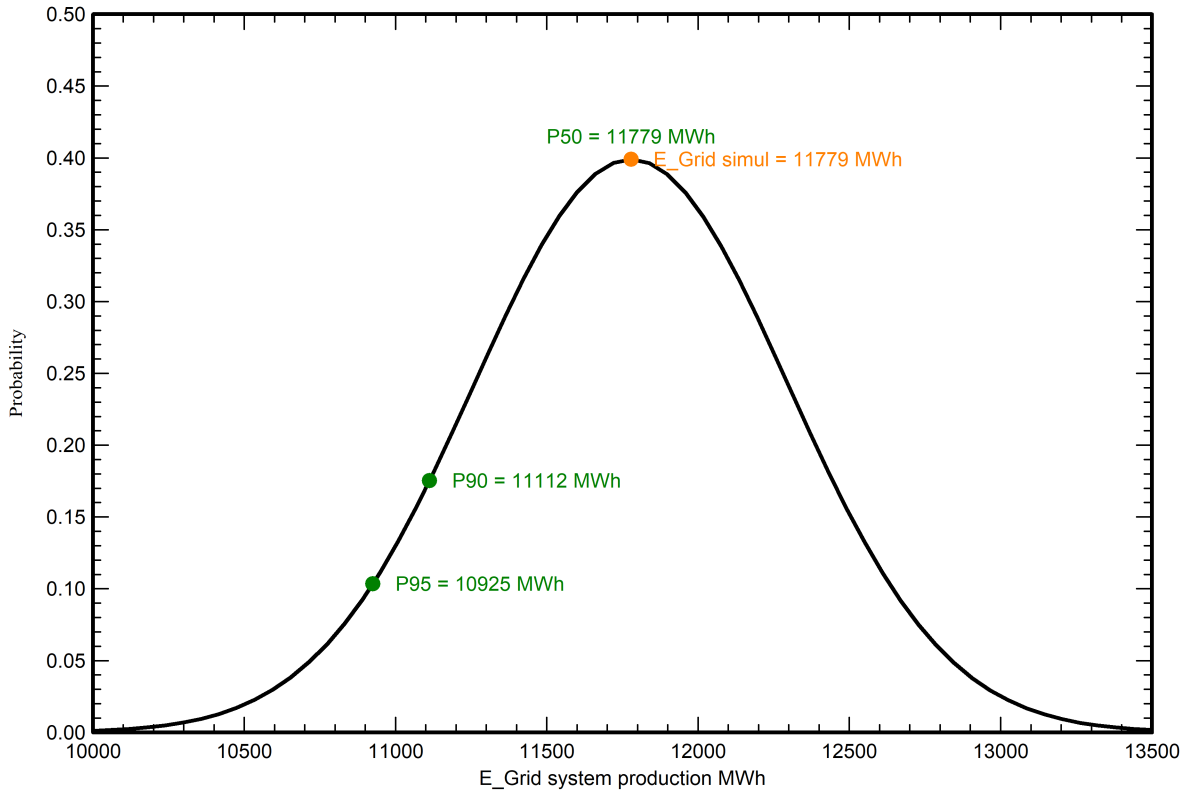
Simulation and parameters uncertainties

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	520 MWh
P50	11779 MWh
P90	11112 MWh
P95	10925 MWh

Probability distribution



Single-line diagram

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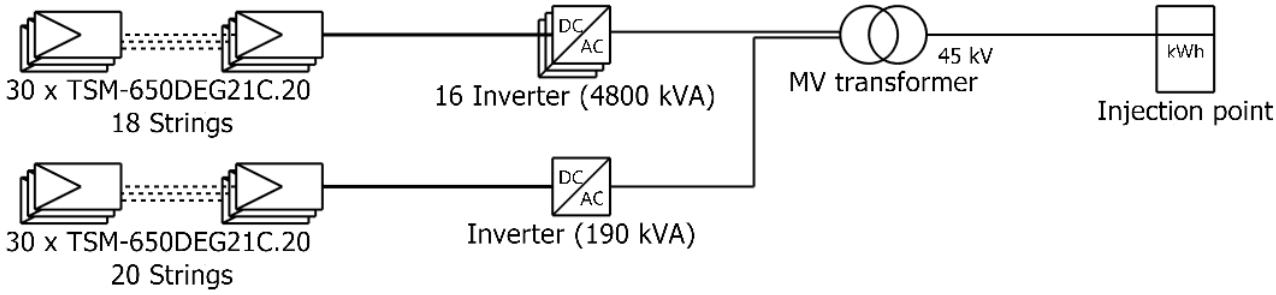

PV module	TSM-650DEG21C.20
Inverter	SUN2000-330KTL-H1-Preliminary V0.1
String	30 x TSM-650DEG21C.20

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