Preliminary Environmental Information Report

Appendix 12I: PVsyst - Simulation Report

PEIR Appendices [PINS Ref: EN 010171]

Document Reference: EN 010171/PEIR APP/12I

Revision Number: 1

December 2025

Future Energy Llanwern Limited

Project: FEL1001 Llanwern Community Energy

Variant: 500

PVsyst V8.0.13
VC0, Simulation date:
21/07/25 13:31
with V8.0.13

Project summary

Geographical Site	Situation		Project settings	
Redwick	Latitude	51.54 °(N)	Albedo	0.20
United Kingdom	Longitude	-2.84 °(W)		
	Altitude	6 m		
	Time zone	UTC		

Weather data
Redwick
Meteonorm 8.2 (2004-2013), Sat=96% - Synthetic

System summary

Grid-Connected System
Simulation for year no 1

Sheds system

Orientation #1		Near Shadings		User's needs
Fixed plane		According to strings : Fast (table)		Unlimited load (grid)
Tilt/Azimuth	18 / 0 °	Electrical effect	100 %	

System information

PV Array		Inverters	
Nb. of modules	567456 units	Nb. of units	1232 units
Pnom total	374.5 MWp	Total power	369600 kWac
		Pnom ratio	1.01

Results summary

Produced Energy	390.99 GWh/year	Specific production	1044 kWh/kWp/year	Perf. Ratio PR	87.79 %
				Bifacial perf. ratio	86.08 %

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General parameters

Grid-Connected System

Orientation #1

Fixed plane

Tilt/Azimuth	18 / 0 °

Sheds system

Sheds configuration

Nb. of sheds	9574 units
Set of tables	

Shading limit angle

Limit profile angle	36.4 °

Sizes

Sheds spacing	9.84 m
Sensitive width	7.19 m
Average GCR	73.0 %

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon

Free Horizon

Near Shadings

According to strings : Fast (table)

Electrical effect	100 %

Bifacial system definition

Orientation #1

Bifacial system

Model	Unlimited Sheds 2D Model

Bifacial model geometry

Sheds spacing	9.84 m
Sheds width	7.19 m
Limit profile angle	36.4 °
GCR	73.0 %
Height above ground	1.00 m
Nb. of sheds	770 units

Bifacial model definitions

Ground albedo	0.20
Bifaciality factor	70 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Aiko Solar
Model	AIKO-G660-MCH72Dw
(Custom parameters definition)	
AIKO-G660-MCH72Dw V2.pan	
Unit Nom. Power	660 Wp
Number of PV modules	567456 units
Nominal (STC)	374.5 MWp
Modules	23644 string x 24 In series

At operating cond. (50°C)

Pmpp	350.2 MWp
U mpp	1010 V
I mpp	346846 A

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-330KTL-H1
(Custom parameters definition)	
Unit Nom. Power	300 kWac
Number of inverters	1232 units
Total power	369600 kWac
Operating voltage	500-1500 V
Max. power (=>30°C)	330 kWac
Pnom ratio (DC:AC)	1.01
Power sharing within this inverter	

Total PV power

Nominal (STC)	374521 kWp
Total	567456 modules
Module area	1532805 m²
Cell area	1427701 m²

Total inverter power

Total power	369600 kWac
Max. power	406560 kWac
Number of inverters	1232 units
Pnom ratio	1.01

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. 0.002 mΩ
Loss Fraction 0.06 % at STC

LID - Light Induced Degradation
Loss Fraction 0.5 %

Module Quality Loss
Loss Fraction -0.75 %

Module mismatch losses
Loss Fraction 2.00 % at MPP

Strings Mismatch loss
Loss Fraction 0.20 %

Module average degradation
Year no 1
Loss factor 0.4 %/year
Imp / Vmp contributions 80% / 20%
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	1.000	1.000	0.999	0.996	0.977	0.849	0.000

System losses

Auxiliaries loss
Proportional to Power 1.0 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 0.79 % at STC
Inverter: SUN2000-330KTL-H1
Wire section (1232 Inv.) Alu 1232 x 3 x 300 mm²
Average wires length 161 m

MV line up to Injection
MV Voltage 33 kV
Average each transformer
Wires Alu 3 x 1000 mm²
Length 39010 m
Loss Fraction 0.77 % at STC

AC losses in transformers

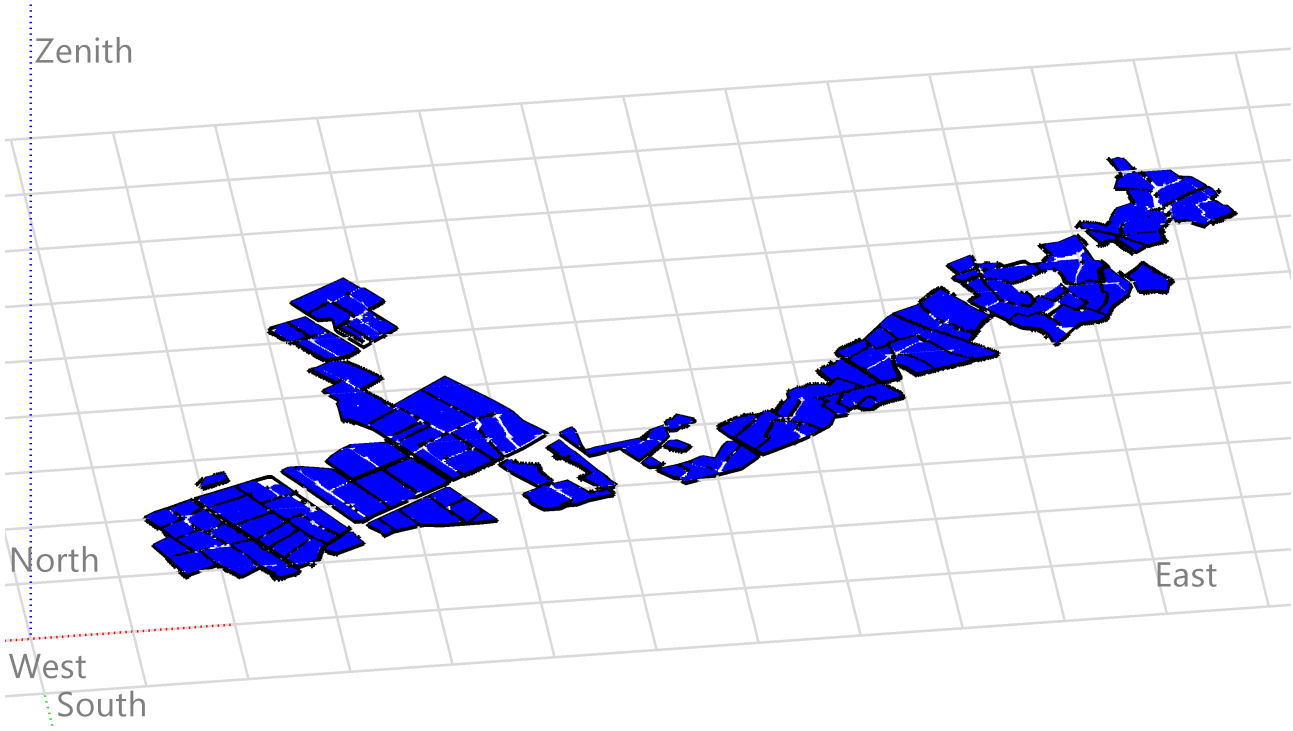
MV transfo
Medium voltage 33 kV

One transfo parameters
Nominal power at STC 6.83 MVA
Iron Loss (24/24 Connexion) 6.84 kVA
Iron loss fraction 0.10 % at STC
Copper loss 68.07 kVA
Copper loss fraction 1.00 % at STC
Coils equivalent resistance 3 x 0.94 mΩ

Operating losses at STC (full system)
Nb. identical MV transfos 54
Nominal power at STC 368.6 MVA
Iron loss (24/24 Connexion) 369.60 kVA
Copper loss 3676.01 kVA

Near shadings parameter

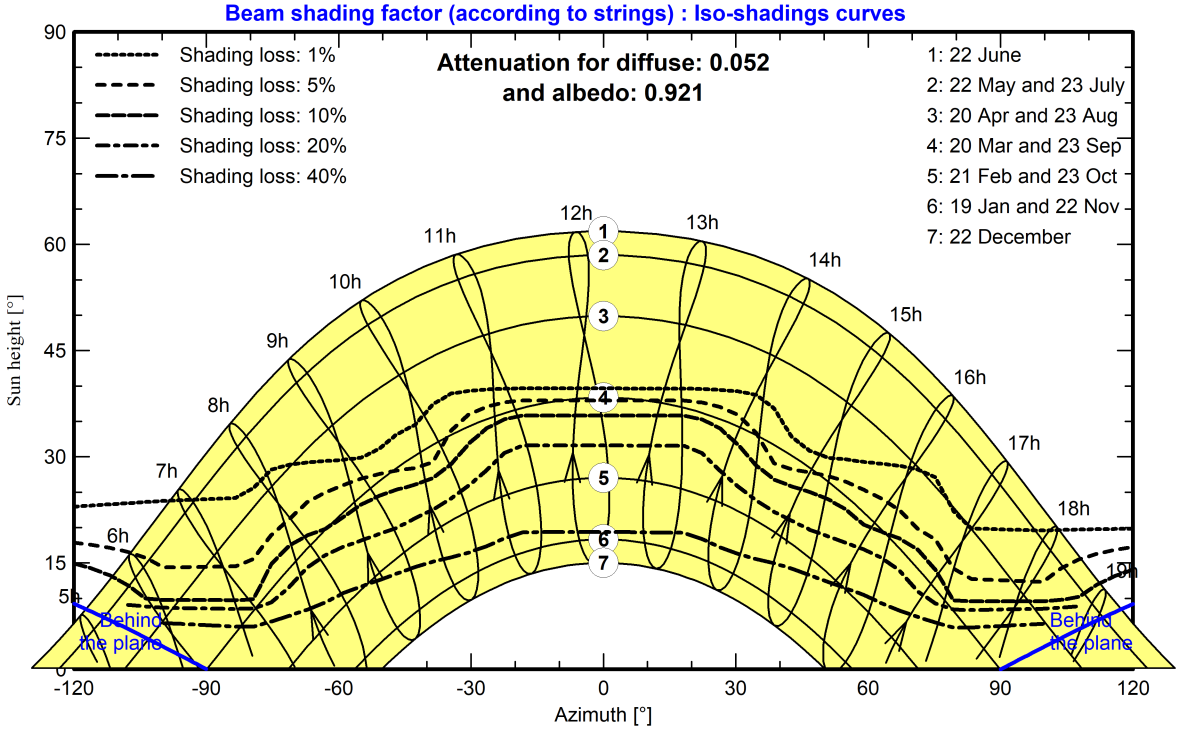
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1 - Fixed plane, Tilts/azimuths: 18°/ 0°

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

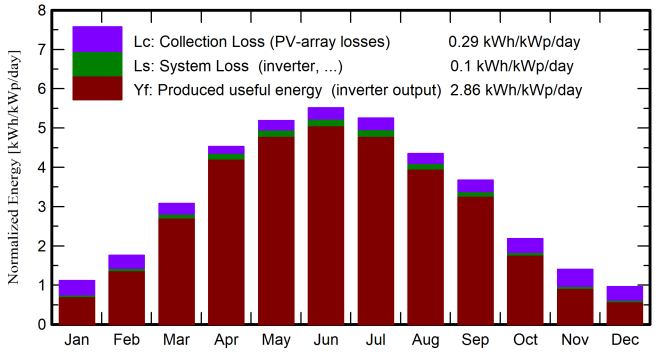


Main results

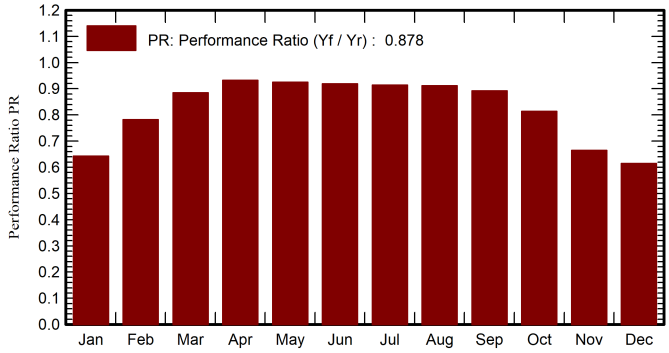
System Production

Produced Energy	390.99 GWh/year	Specific production	1044 kWh/kWp/year
		Perf. Ratio PR	87.79 %
		Bifacial perf. ratio	86.08 %

Normalized productions (per installed kWp)



Performance Ratio PR



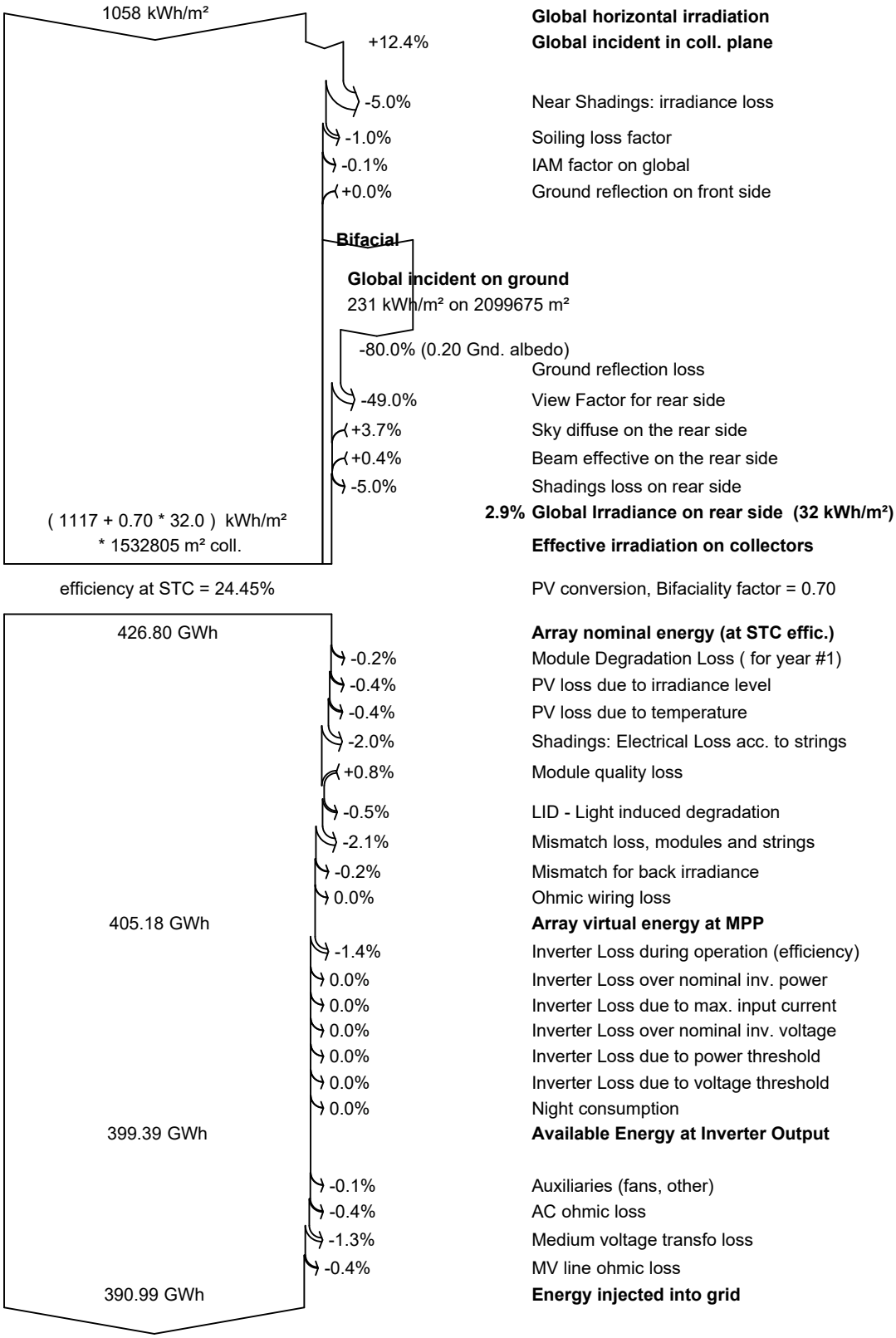
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray GWh	E_Grid GWh	PR ratio	PRBifi ratio
January	23.1	14.72	5.36	34.5	26.3	8.80	8.32	0.643	0.636
February	38.3	25.61	5.33	49.4	43.1	15.05	14.47	0.783	0.772
March	80.0	48.85	7.10	95.5	90.2	32.70	31.64	0.885	0.872
April	122.6	69.47	9.36	135.9	131.1	49.03	47.44	0.932	0.913
May	153.8	75.77	12.45	160.8	155.5	57.61	55.67	0.925	0.903
June	161.6	79.29	15.31	165.4	160.0	58.87	56.89	0.918	0.896
July	157.4	78.13	17.23	162.9	157.6	57.68	55.73	0.913	0.891
August	124.7	67.11	16.87	134.9	130.2	47.64	46.04	0.911	0.891
September	93.8	51.49	14.76	110.3	105.7	38.09	36.83	0.891	0.878
October	54.4	34.70	12.02	67.8	61.6	21.42	20.64	0.813	0.803
November	28.8	16.49	8.36	42.1	33.5	10.99	10.48	0.665	0.658
December	19.3	12.67	6.25	29.8	21.8	7.30	6.86	0.615	0.608
Year	1057.8	574.28	10.90	1189.2	1116.6	405.18	390.99	0.878	0.861

Legends

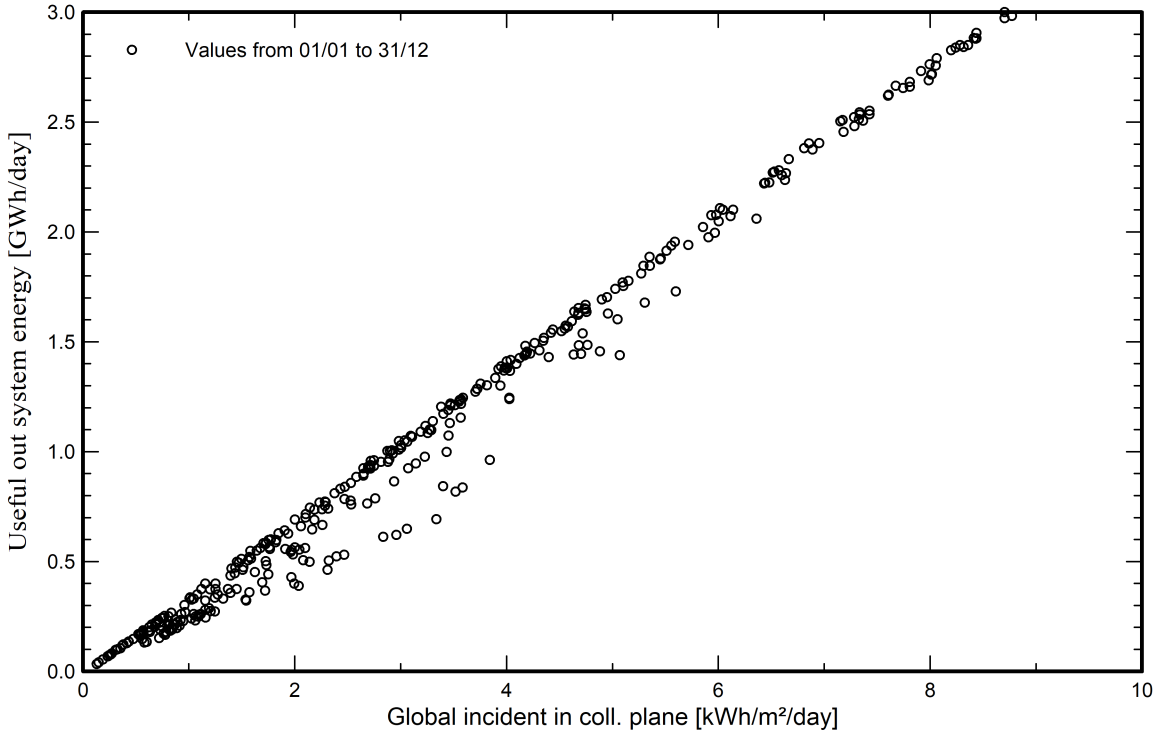
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane	PRBifi	Bifacial Performance Ratio
GlobEff	Effective Global,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

Loss diagram

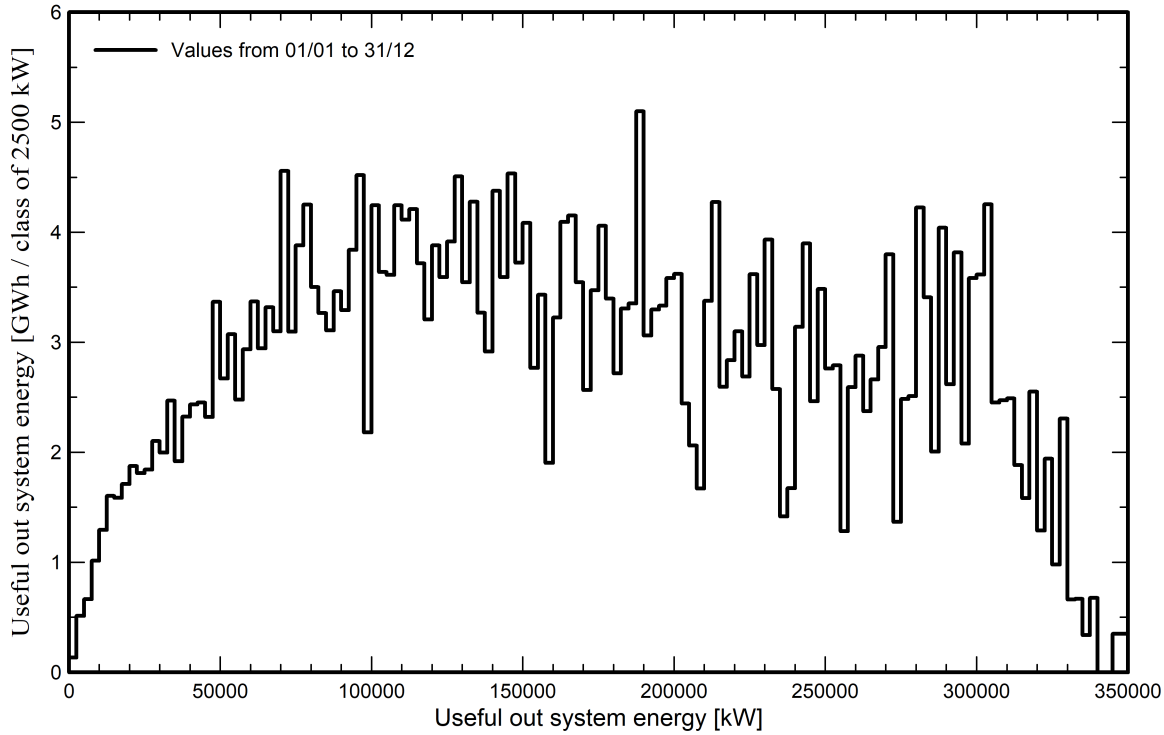


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



P50 - P90 evaluation

Weather data

Source	Meteonorm 8.2 (2004-2013), Sat=96%
Kind	Monthly averages
Synthetic - Multi-year average	
Year-to-year variability(Variance)	4.9 %
Specified Deviation	
Climate change	0.0 %

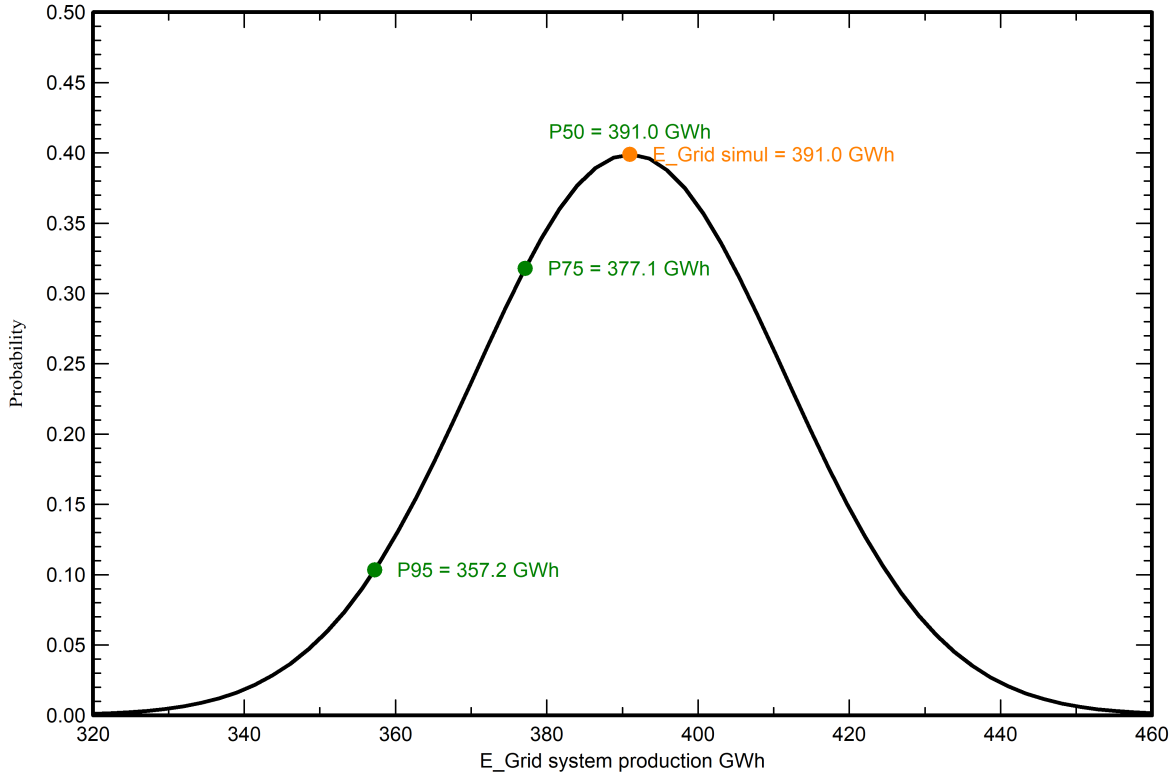
Simulation and parameters uncertainties

PV module modelling/parameters	1.0 %
Inverter efficiency uncertainty	0.5 %
Soiling and mismatch uncertainties	1.0 %
Degradation uncertainty	1.0 %

Global variability (weather data + system)

Variability (Quadratic sum)	5.3 %

Annual production probability

Variability	20.5 GWh
P50	391.0 GWh
P75	377.1 GWh
P95	357.2 GWh

Probability distribution