



REGIONE: <b>SICILIA</b>	PROVINCIA: <b>PALERMO</b>
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COMUNI: <b>MEZZOJUSO, CAMPOFELICE DI FITALIA, CIMINNA</b>	LOCALITA': <b>C/da Farra, C/da Fondacazzo, C/da Pizzo Mezzaluna. C/da Porrazzi</b>
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TIPO PROGETTO: <b>PD</b>	OGGETTO: Progetto per la realizzazione di un impianto agrovoltaico denominato 'Agrovoltaico Mezzojuso' per la produzione di energia elettrica con una potenza installata di 57,56 MW, potenza di immissione di 50,00 MW e potenza del sistema di accumulo di 10 MW, per la produzione agricola di beni e servizi oltre alle opere connesse e alle infrastrutture indispensabili nelle aree identificate nei comuni di Mezzojuso (PA), Campofelice di Fitalia (PA) e Ciminna (PA).
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TAVOLA N.: <b>EL02.093</b>	IMPIANTO: <b>AGROFOTOVOLTAICO MEZZOJUSO</b>	SCALA
	ELABORATO: <b>REPORT PVSYST</b>	COD. DOC.   REV.

PROPONENTE: <b>FRI-ELSUN</b>	RESPONSABILE:  <i>Timbro e Firma</i>	APPROVATO DA:  <i>Timbro e Firma</i>
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PROGETTISTA 	DIRETTORE TECNICO: ARCH: FRANCESCO LAUDICINA  <i>Timbro e Firma</i>	REDATTO DA: 
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REV.	DATA	REDATTO	DESCRIZIONE
0			
1			
2			
3			

Ordine Nazionale dei Biologi  
 Sez. A - N. AA. 083791  
 Dott. Salvatore Cambria

# PVsyst - Simulation report

## Grid-Connected System

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Progetto: Progetto PV\_MEZZOJUSO

Località: Vicari/Mezzojuso (PA)

Insegitore singolo + Struttura fissa

System power: 57.56 MWp

Villafrati - Italia



Progettisti



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**Project summary**

<b>Geographical Site</b> Villafrati Italia	<b>Situation</b> Latitude 37.91 °N Longitude 13.48 °E Altitude 458 m Time zone UTC+1	<b>Project settings</b> Albedo 0.20
<b>Meteo data</b> Villafrati PVGIS api TMY		

**System summary**

<b>Grid-Connected System</b>	<b>Inseguitore singolo + Struttura fissa</b>		
<b>PV Field Orientation</b> Tracking plane, horizontal N-S axis Axis azimuth 0 °	<b>Near Shadings</b> Linear shadings	<b>User's needs</b> Unlimited load (grid)	
<b>System information</b>			
<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	98400 units	Nb. of units	248 units
Pnom total	57.56 MWp	Pnom total	53.32 MWac
		Pnom ratio	1.080

**Results summary**

Produced Energy	109366 MWh/year	Specific production	1900 kWh/kWp/year	Perf. Ratio PR	85.54 %
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**General parameters**

<b>Grid-Connected System</b>		<b>Inseguitore singolo + Struttura fissa</b>	
<b>PV Field Orientation</b>		<b>Backtracking strategy</b>	
<b>Orientation</b>		<b>Nb. of trackers</b>	1360 units
Tracking plane, horizontal N-S axis		<b>Sizes</b>	
Axis azimuth	0 °	Tracker Spacing	10.00 m
		Collector width	4.84 m
		Ground Cov. Ratio (GCR)	48.4 %
		Phi min / max.	-/+ 45.0 °
		<b>Backtracking limit angle</b>	
		Phi limits	+/- 60.9 °
<b>Horizon</b>		<b>Near Shadings</b>	
Average Height	6.6 °	Linear shadings	
		<b>Models used</b>	
		Transposition	Perez
		Diffuse	Imported
		Circumsolar	separate
		<b>User's needs</b>	
		Unlimited load (grid)	

**PV Array Characteristics**

<b>PV module</b>		<b>Inverter</b>	
Manufacturer	Jinkosolar	Manufacturer	Huawei Technologies
Model	JKM585M-7RL4-V	Model	SUN2000-215KTL- H0
(Original PVsyst database)		(Custom parameters definition)	
Unit Nom. Power	585 Wp	Unit Nom. Power	215 kWac
Number of PV modules	98400 units	Number of inverters	248 units
Nominal (STC)	57.56 MWp	Total power	53320 kWac
<b>Array #1 - PRJ_02_FV_01</b>			
Number of PV modules	1704 units	Number of inverters	4 units
Nominal (STC)	997 kWp	Total power	860 kWac
Modules	71 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	909 kWp	Pnom ratio (DC:AC)	1.16
U mpp	967 V		
I mpp	941 A		
<b>Array #2 - PRJ_02_FV_02.01</b>			
Number of PV modules	3888 units	Number of inverters	10 units
Nominal (STC)	2274 kWp	Total power	2150 kWac
Modules	162 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	2075 kWp	Pnom ratio (DC:AC)	1.06
U mpp	967 V		
I mpp	2147 A		
<b>Array #3 - PRJ_02_FV_02.02</b>			
Number of PV modules	5136 units	Number of inverters	13 units
Nominal (STC)	3005 kWp	Total power	2795 kWac
Modules	214 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	2741 kWp	Pnom ratio (DC:AC)	1.07
U mpp	967 V		
I mpp	2836 A		



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PV Array Characteristics

**Array #4 - PRJ\_02\_FV\_02.03**

Number of PV modules	5136 units	Number of inverters	13 units
Nominal (STC)	3005 kWp	Total power	2795 kWac
Modules	214 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	2741 kWp	Pnom ratio (DC:AC)	1.07
U mpp	967 V		
I mpp	2836 A		

**Array #5 - PRJ\_02\_FV\_02.04**

Number of PV modules	5136 units	Number of inverters	13 units
Nominal (STC)	3005 kWp	Total power	2795 kWac
Modules	214 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	2741 kWp	Pnom ratio (DC:AC)	1.07
U mpp	967 V		
I mpp	2836 A		

**Array #6 - PRJ\_02\_FV\_02.05**

Number of PV modules	3480 units	Number of inverters	9 units
Nominal (STC)	2036 kWp	Total power	1935 kWac
Modules	145 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	1857 kWp	Pnom ratio (DC:AC)	1.05
U mpp	967 V		
I mpp	1921 A		

**Array #7 - PRJ\_02\_FV\_04.01**

Number of PV modules	3744 units	Number of inverters	9 units
Nominal (STC)	2190 kWp	Total power	1935 kWac
Modules	156 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	1998 kWp	Pnom ratio (DC:AC)	1.13
U mpp	967 V		
I mpp	2067 A		

**Array #8 - PRJ\_02\_FV\_04.02**

Number of PV modules	3744 units	Number of inverters	9 units
Nominal (STC)	2190 kWp	Total power	1935 kWac
Modules	156 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	1998 kWp	Pnom ratio (DC:AC)	1.13
U mpp	967 V		
I mpp	2067 A		

**Array #9 - PRJ\_02\_FV\_04.03**

Number of PV modules	3696 units	Number of inverters	9 units
Nominal (STC)	2162 kWp	Total power	1935 kWac
Modules	154 Strings x 24 In series		
<b>At operating cond. (50°C)</b>		Operating voltage	550-1500 V
Pmpp	1973 kWp	Pnom ratio (DC:AC)	1.12
U mpp	967 V		
I mpp	2041 A		



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PV Array Characteristics

**Array #10 - PRJ\_02\_FV\_05.01**

Number of PV modules	3864 units	Number of inverters	10 units
Nominal (STC)	2260 kWp	Total power	2150 kWac
Modules	161 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2062 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.05
I mpp	2133 A		

**Array #11 - PRJ\_02\_FV\_05.02**

Number of PV modules	5280 units	Number of inverters	13 units
Nominal (STC)	3089 kWp	Total power	2795 kWac
Modules	220 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2818 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.11
I mpp	2915 A		

**Array #12 - PRJ\_02\_FV\_05.03**

Number of PV modules	5280 units	Number of inverters	13 units
Nominal (STC)	3089 kWp	Total power	2795 kWac
Modules	220 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2818 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.11
I mpp	2915 A		

**Array #13 - PRJ\_02\_FV\_05.04**

Number of PV modules	3048 units	Number of inverters	8 units
Nominal (STC)	1783 kWp	Total power	1720 kWac
Modules	127 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1627 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.04
I mpp	1683 A		

**Array #14 - PRJ\_02\_FV\_06.01**

Number of PV modules	4992 units	Number of inverters	12 units
Nominal (STC)	2920 kWp	Total power	2580 kWac
Modules	208 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2664 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.13
I mpp	2756 A		

**Array #15 - PRJ\_02\_FV\_06.02**

Number of PV modules	3576 units	Number of inverters	9 units
Nominal (STC)	2092 kWp	Total power	1935 kWac
Modules	149 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1909 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.08
I mpp	1974 A		

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**PV Array Characteristics****Array #16 - PRJ\_02\_FV\_06.03**

Number of PV modules	3408 units	Number of inverters	9 units
Nominal (STC)	1994 kWp	Total power	1935 kWac
Modules	142 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1819 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.03
I mpp	1882 A		

**Array #17 - PRJ\_02\_FV\_06.04**

Number of PV modules	4488 units	Number of inverters	11 units
Nominal (STC)	2625 kWp	Total power	2365 kWac
Modules	187 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2395 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.11
I mpp	2478 A		

**Array #18 - PRJ\_02\_FV\_06.05**

Number of PV modules	4488 units	Number of inverters	11 units
Nominal (STC)	2625 kWp	Total power	2365 kWac
Modules	187 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2395 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.11
I mpp	2478 A		

**Array #19 - PRJ\_02\_FV\_06.06**

Number of PV modules	3576 units	Number of inverters	9 units
Nominal (STC)	2092 kWp	Total power	1935 kWac
Modules	149 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1909 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.08
I mpp	1974 A		

**Array #20 - PRJ\_02\_FV\_06.07**

Number of PV modules	3624 units	Number of inverters	9 units
Nominal (STC)	2120 kWp	Total power	1935 kWac
Modules	151 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1934 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.10
I mpp	2001 A		

**Array #21 - PRJ\_02\_FV\_07**

Number of PV modules	4104 units	Number of inverters	10 units
Nominal (STC)	2401 kWp	Total power	2150 kWac
Modules	171 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	2190 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.12
I mpp	2266 A		

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**PV Array Characteristics****Array #22 - PRJ\_02\_FV\_09.01**

Number of PV modules	2880 units	Number of inverters	7 units
Nominal (STC)	1685 kWp	Total power	1505 kWac
Modules	120 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1537 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.12
I mpp	1590 A		

**Array #23 - PRJ\_02\_FV\_09.02**

Number of PV modules	984 units	Number of inverters	3 units
Nominal (STC)	576 kWp	Total power	645 kWac
Modules	41 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	525 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	0.89
I mpp	543 A		

**Array #24 - PRJ\_02\_FV\_09.03**

Number of PV modules	480 units	Number of inverters	2 units
Nominal (STC)	281 kWp	Total power	430 kWac
Modules	20 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	256 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	0.65
I mpp	265 A		

**Array #25 - PRJ\_02\_FV\_09.04**

Number of PV modules	288 units	Number of inverters	1 unit
Nominal (STC)	168 kWp	Total power	215 kWac
Modules	12 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	154 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	0.78
I mpp	159 A		

**Array #26 - PRJ\_02\_FV\_11**

Number of PV modules	1272 units	Number of inverters	4 units
Nominal (STC)	744 kWp	Total power	860 kWac
Modules	53 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	679 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	0.87
I mpp	702 A		

**Array #27 - PRJ\_02\_FV\_12**

Number of PV modules	768 units	Number of inverters	2 units
Nominal (STC)	449 kWp	Total power	430 kWac
Modules	32 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	410 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.04
I mpp	424 A		



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**PV Array Characteristics**

<b>Array #28 - PRJ_02_FV_13.01</b>			
Number of PV modules	3144 units	Number of inverters	8 units
Nominal (STC)	1839 kWp	Total power	1720 kWac
Modules	131 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1678 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.07
I mpp	1736 A		
<b>Array #29 - PRJ_02_FV_13.02</b>			
Number of PV modules	3192 units	Number of inverters	8 units
Nominal (STC)	1867 kWp	Total power	1720 kWac
Modules	133 Strings x 24 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	1704 kWp	Operating voltage	550-1500 V
U mpp	967 V	Pnom ratio (DC:AC)	1.09
I mpp	1762 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	57564 kWp	Total power	53320 kWac
Total	98400 modules	Nb. of inverters	248 units
Module area	269033 m <sup>2</sup>	Pnom ratio	1.08

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**Array losses****Array Soiling Losses**

Loss Fraction 3.0 %

**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

**Module Quality Loss**

Loss Fraction -0.8 %

**Module mismatch losses**

Loss Fraction 2.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.1 %

**IAM loss factor**

Incidence effect (IAM): Fresnel AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

**Spectral correction**

FirstSolar model

Precipitable water estimated from relative humidity

Coefficient Set	C0	C1	C2	C3	C4	C5
Monocrystalline Si	0,85914	-0,02088	-0,0058853	0,12029	0,026814	-0,001781

**DC wiring losses**

Global wiring resistance 0.30 mΩ  
Loss Fraction 1.5 % at STC

**Array #1 - PRJ\_02\_FV\_01**

Global array res. 9.0 mΩ  
Loss Fraction 0.8 % at STC

**Array #3 - PRJ\_02\_FV\_02.02**

Global array res. 6.8 mΩ  
Loss Fraction 1.8 % at STC

**Array #5 - PRJ\_02\_FV\_02.04**

Global array res. 6.8 mΩ  
Loss Fraction 1.8 % at STC

**Array #7 - PRJ\_02\_FV\_04.01**

Global array res. 7.7 mΩ  
Loss Fraction 1.5 % at STC

**Array #9 - PRJ\_02\_FV\_04.03**

Global array res. 7.8 mΩ  
Loss Fraction 1.5 % at STC

**Array #11 - PRJ\_02\_FV\_05.02**

Global array res. 6.8 mΩ  
Loss Fraction 1.8 % at STC

**Array #13 - PRJ\_02\_FV\_05.04**

Global array res. 8.5 mΩ  
Loss Fraction 1.3 % at STC

**Array #15 - PRJ\_02\_FV\_06.02**

Global array res. 7.9 mΩ  
Loss Fraction 1.5 % at STC

**Array #17 - PRJ\_02\_FV\_06.04**

Global array res. 7.2 mΩ  
Loss Fraction 1.7 % at STC

**Array #2 - PRJ\_02\_FV\_02.01**

Global array res. 7.6 mΩ  
Loss Fraction 1.5 % at STC

**Array #4 - PRJ\_02\_FV\_02.03**

Global array res. 6.8 mΩ  
Loss Fraction 1.8 % at STC

**Array #6 - PRJ\_02\_FV\_02.05**

Global array res. 8.0 mΩ  
Loss Fraction 1.4 % at STC

**Array #8 - PRJ\_02\_FV\_04.02**

Global array res. 7.7 mΩ  
Loss Fraction 1.5 % at STC

**Array #10 - PRJ\_02\_FV\_05.01**

Global array res. 7.6 mΩ  
Loss Fraction 1.5 % at STC

**Array #12 - PRJ\_02\_FV\_05.03**

Global array res. 6.8 mΩ  
Loss Fraction 1.8 % at STC

**Array #14 - PRJ\_02\_FV\_06.01**

Global array res. 6.9 mΩ  
Loss Fraction 1.8 % at STC

**Array #16 - PRJ\_02\_FV\_06.03**

Global array res. 8.1 mΩ  
Loss Fraction 1.4 % at STC

**Array #18 - PRJ\_02\_FV\_06.05**

Global array res. 7.2 mΩ  
Loss Fraction 1.7 % at STC



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**DC wiring losses**

<b>Array #19 - PRJ_02_FV_06.06</b>			
Global array res.	7.9 mΩ	Global array res.	7.9 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC
<b>Array #21 - PRJ_02_FV_07</b>			
Global array res.	7.4 mΩ	Global array res.	8.8 mΩ
Loss Fraction	1.6 % at STC	Loss Fraction	1.3 % at STC
<b>Array #23 - PRJ_02_FV_09.02</b>			
Global array res.	17 mΩ	Global array res.	31 mΩ
Loss Fraction	0.9 % at STC	Loss Fraction	0.8 % at STC
<b>Array #25 - PRJ_02_FV_09.04</b>			
Global array res.	48 mΩ	Global array res.	14 mΩ
Loss Fraction	0.7 % at STC	Loss Fraction	0.9 % at STC
<b>Array #27 - PRJ_02_FV_12</b>			
Global array res.	21 mΩ	Global array res.	8.4 mΩ
Loss Fraction	0.8 % at STC	Loss Fraction	1.4 % at STC
<b>Array #29 - PRJ_02_FV_13.02</b>			
Global array res.	8.3 mΩ		
Loss Fraction	1.4 % at STC		
<b>Array #20 - PRJ_02_FV_06.07</b>			
Global array res.	7.9 mΩ	Global array res.	7.9 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC
<b>Array #22 - PRJ_02_FV_09.01</b>			
Global array res.	7.4 mΩ	Global array res.	8.8 mΩ
Loss Fraction	1.6 % at STC	Loss Fraction	1.3 % at STC
<b>Array #24 - PRJ_02_FV_09.03</b>			
Global array res.	17 mΩ	Global array res.	31 mΩ
Loss Fraction	0.9 % at STC	Loss Fraction	0.8 % at STC
<b>Array #26 - PRJ_02_FV_11</b>			
Global array res.	48 mΩ	Global array res.	14 mΩ
Loss Fraction	0.7 % at STC	Loss Fraction	0.9 % at STC
<b>Array #28 - PRJ_02_FV_13.01</b>			
Global array res.	21 mΩ	Global array res.	8.4 mΩ
Loss Fraction	0.8 % at STC	Loss Fraction	1.4 % at STC



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Horizon definition

Horizon from PVGIS website API, Lat=37°54'48', Long=13°28'53', Alt=458m

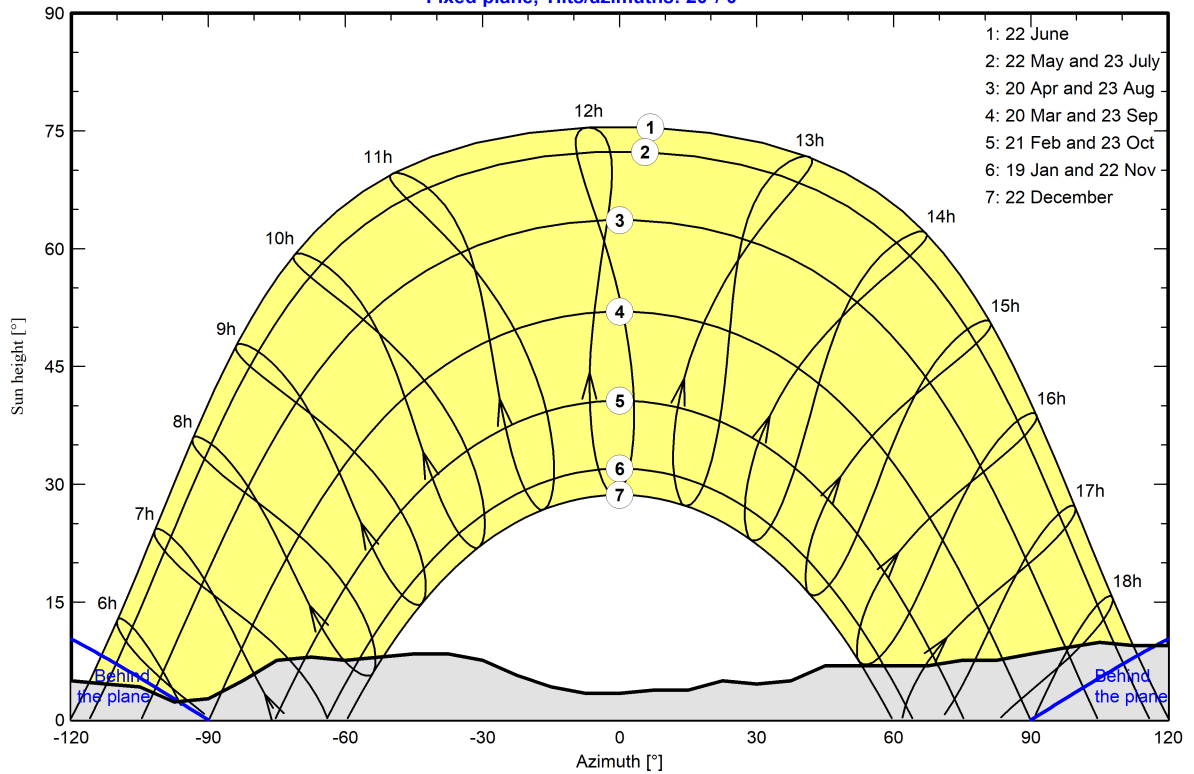
Average Height	6.6 °	Albedo Factor	0.59
Diffuse Factor	0.92	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-150	-143	-135	-128	-120	-113	-105	-98	-90	-83
Height [°]	6.9	8.4	8.4	5.7	5.0	5.0	5.3	5.3	5.0	4.6	4.2	2.3	2.7	5.0
Azimuth [°]	-75	-68	-60	-53	-45	-38	-30	-23	-15	-8	0	8	15	23
Height [°]	7.6	8.0	7.6	8.0	8.4	8.4	7.6	5.7	4.2	3.4	3.4	3.8	3.8	5.0
Azimuth [°]	30	38	45	68	75	83	90	98	105	113	158	165	173	180
Height [°]	4.6	5.0	6.9	6.9	7.6	7.6	8.4	9.2	9.9	9.5	9.5	5.0	5.0	6.9

Sun Paths (Height / Azimuth diagram)

Fixed plane, Tilts/azimuths: 20°/ 0°



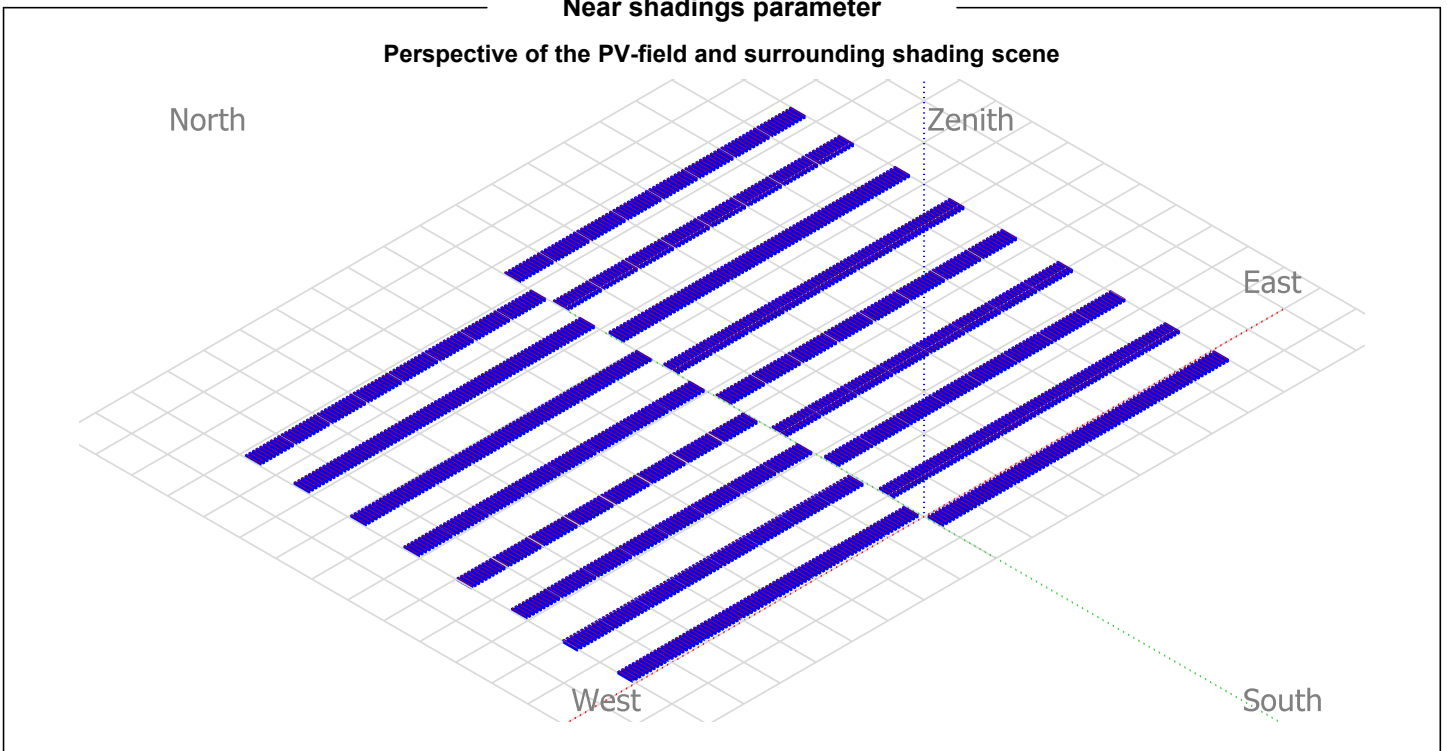


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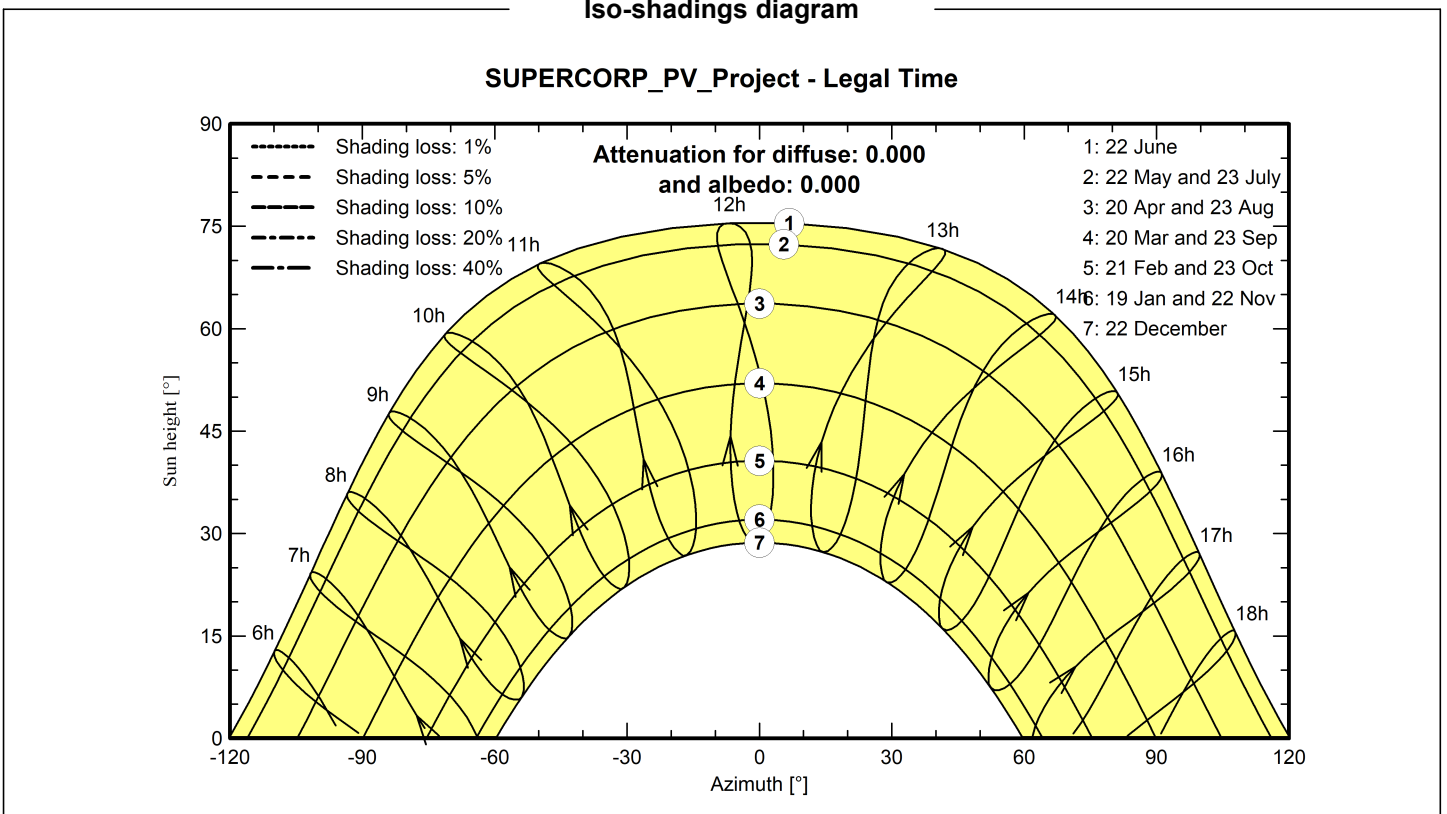
**Near shadings parameter**

Perspective of the PV-field and surrounding shading scene



**Iso-shadings diagram**

SUPERCORP\_PV\_Project - Legal Time





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**Main results**

**System Production**

Produced Energy 109366 MWh/year

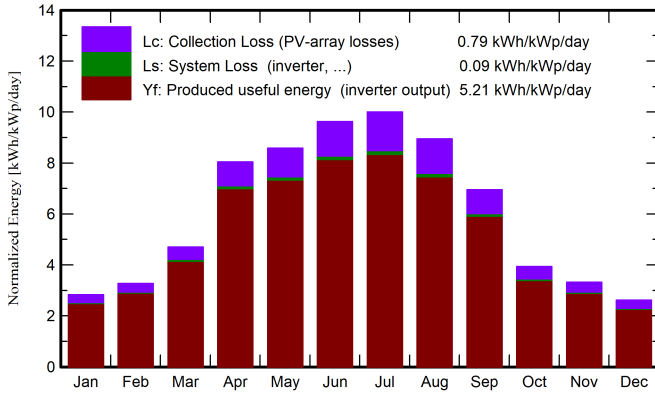
Specific production

1900 kWh/kWp/year

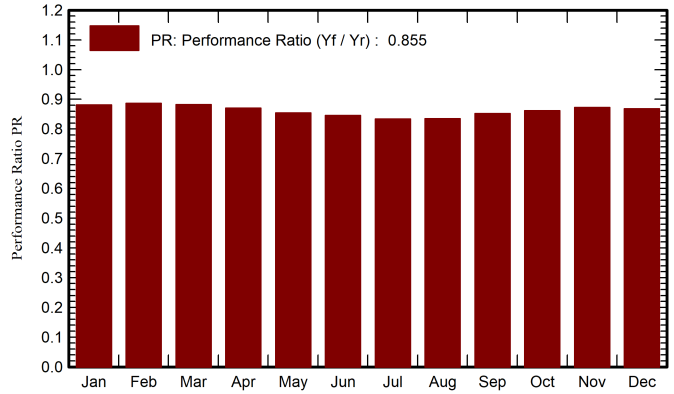
Performance Ratio PR

85.54 %

**Normalized productions (per installed kWp)**



**Performance Ratio PR**



**Balances and main results**

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray MWh	EArrMPP MWh	EffSysR %	EArray MWh	EffSysR %
January	68.3	30.08	11.80	87.7	79.1	4515	4515	18.85	4515	18.85
February	74.4	41.14	9.23	91.8	83.7	4755	4755	18.97	4755	18.97
March	116.5	55.59	11.28	146.0	135.3	7534	7534	18.88	7534	18.88
April	191.1	66.95	12.93	241.4	226.3	12296	12297	18.63	12296	18.63
May	211.9	70.26	16.76	266.2	250.1	13320	13322	18.29	13320	18.29
June	228.4	72.24	20.29	288.8	271.8	14300	14301	18.09	14300	18.09
July	241.2	63.14	24.89	310.3	293.0	15155	15155	17.84	15155	17.84
August	214.0	61.78	24.67	277.4	260.9	13567	13567	17.86	13567	17.86
September	162.4	56.12	22.34	208.4	195.3	10395	10395	18.23	10395	18.23
October	99.6	49.47	19.16	122.2	112.7	6167	6167	18.45	6167	18.45
November	77.0	32.21	16.30	99.6	90.5	5085	5085	18.68	5085	18.68
December	64.4	32.69	12.85	81.2	72.0	4119	4119	18.57	4119	18.57
<b>Year</b>	<b>1749.2</b>	<b>631.68</b>	<b>16.93</b>	<b>2221.0</b>	<b>2070.7</b>	<b>111208</b>	<b>111211</b>	<b>18.30</b>	<b>111208</b>	<b>18.30</b>

**Legends**

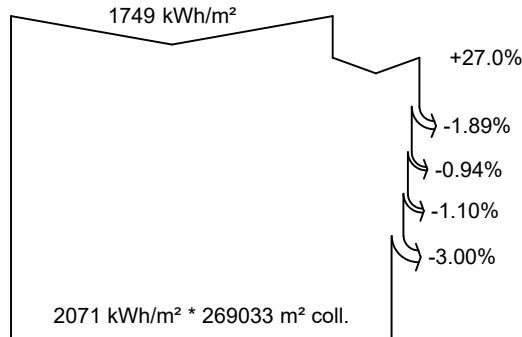
- |         |  |         |   |
|---------|--|---------|---|
| GlobHor | Global horizontal irradiation                | EArray  | Effective energy at the output of the array |
| DiffHor | Horizontal diffuse irradiation               | EArrMPP | Array virtual energy at MPP                 |
| T_Amb   | Ambient Temperature                          | EffSysR | Effic. Eout system / rough area             |
| GlobInc | Global incident in coll. plane               | EArray  | Effective energy at the output of the array |
| GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area             |



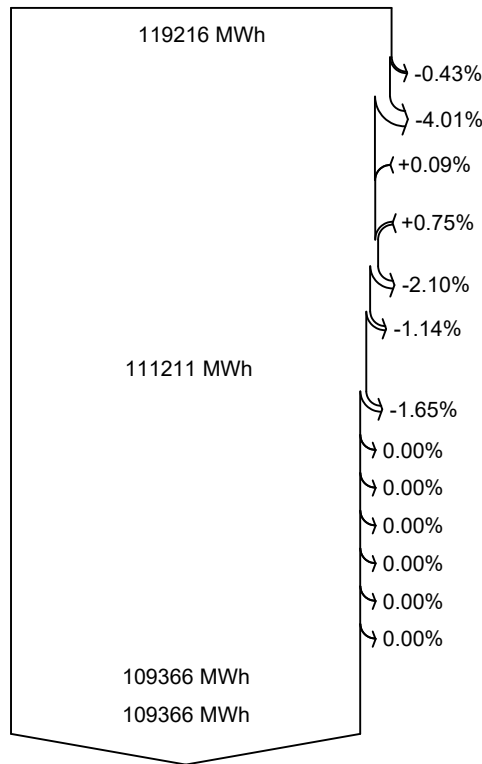
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**Loss diagram**



efficiency at STC = 21.40%



**Global horizontal irradiation**

**Global incident in coll. plane**

Far Shadings / Horizon

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

**Effective irradiation on collectors**

PV conversion

**Array nominal energy (at STC effic.)**

PV loss due to irradiance level

PV loss due to temperature

Spectral correction

Module quality loss

Mismatch loss, modules and strings

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**

**Energy injected into grid**

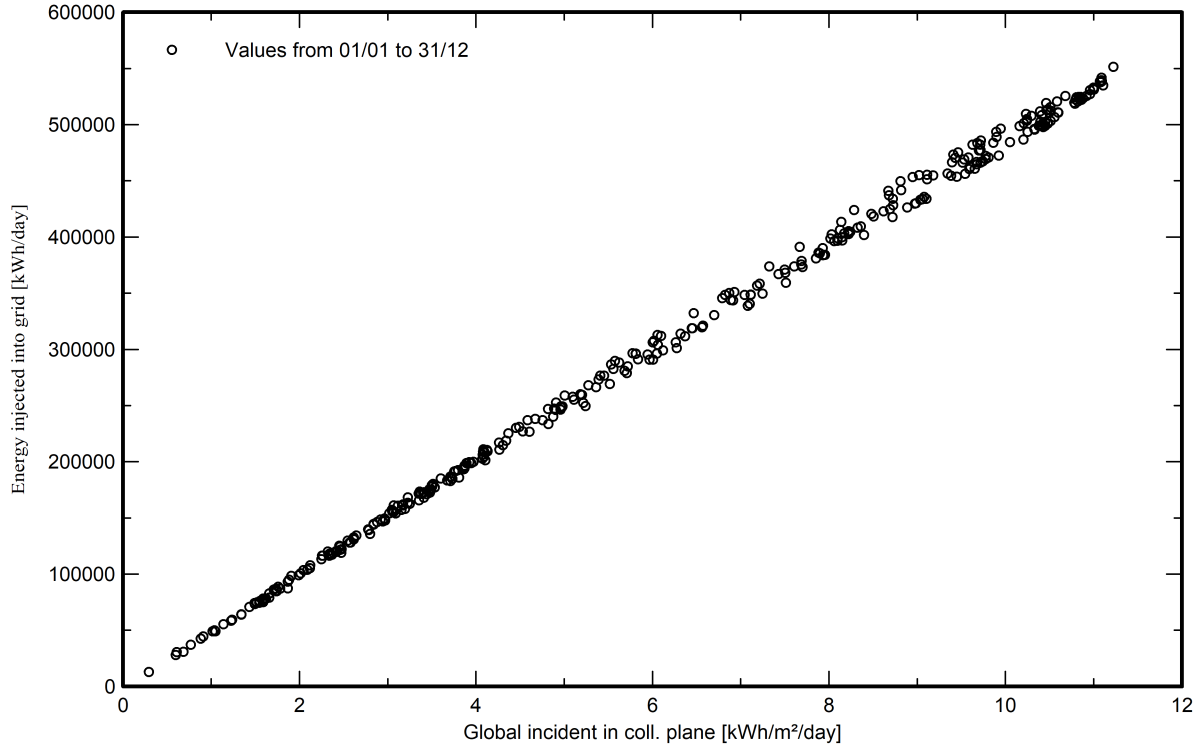


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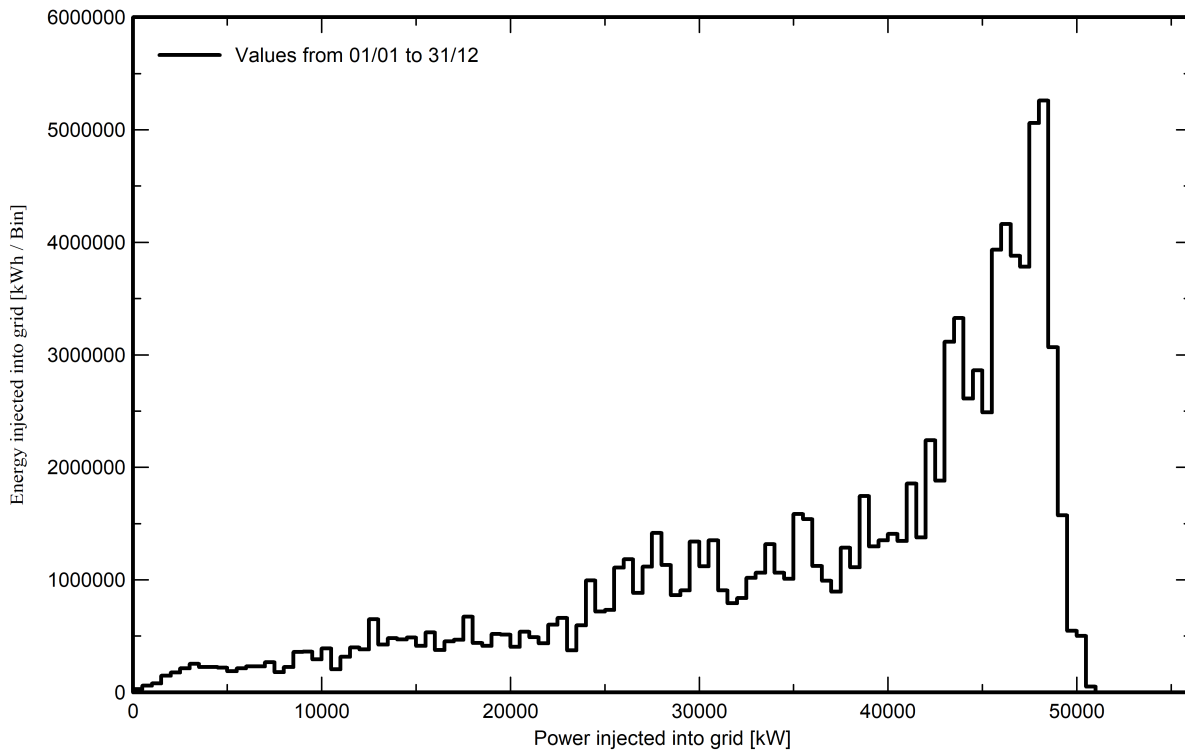
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**Special graphs**

**Diagramma giornaliero entrata/uscita**



**Distribuzione potenza in uscita sistema**







**PVsyst V7.2.8**

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**P50 - P90 evaluation**

**Meteo data**

Source	PVGIS api TMY
Kind	Own measured
Year	TMY
Year-to-year variability(Variance)	0.5 %

**Specified Deviation**

Year deviation from average	0.0 %
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**Global variability (meteo + system)**

Variability (Quadratic sum)	1.9 %
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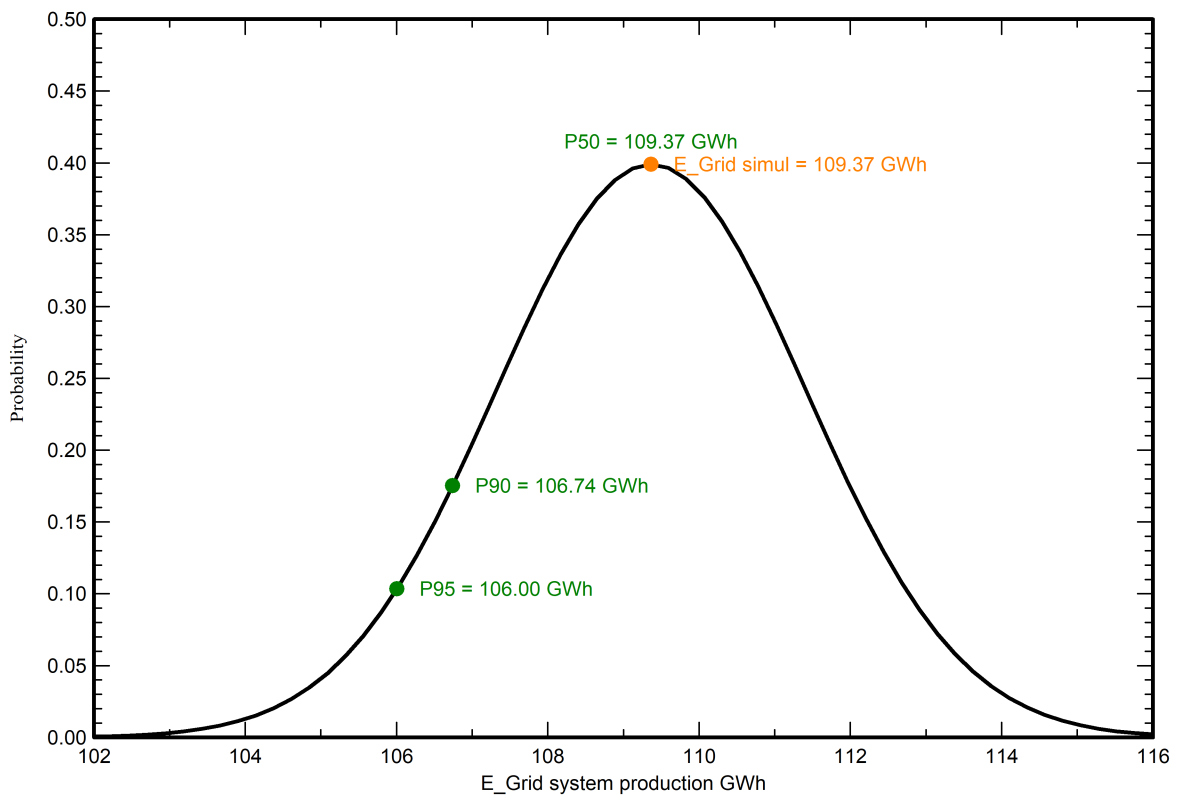
**Simulation and parameters uncertainties**

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	2.05 GWh
P50	109.37 GWh
P90	106.74 GWh
P95	106.00 GWh

**Probability distribution**





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**Cost of the system**

**Installation costs**

Item	Quantity units	Cost EUR	Total EUR
Total			0.00
Depreciable asset			0.00

**Operating costs**

Item	Total EUR/year
Total (OPEX)	0.00

**System summary**

Total installation cost	0.00 EUR
Operating costs	0.00 EUR/year
Produced Energy	109366 MWh/year
Cost of produced energy (LCOE)	0.000 EUR/kWh



**PVsyst V7.2.8**

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**CO<sub>2</sub> Emission Balance**

Total: 1760291.3 tCO<sub>2</sub>

**Generated emissions**

Total: 118598.68 tCO<sub>2</sub>

Source: Detailed calculation from table below:

**Replaced Emissions**

Total: 2165454.5 tCO<sub>2</sub>

System production: 109366.39 MWh/yr

Grid Lifecycle Emissions: 660 gCO<sub>2</sub>/kWh

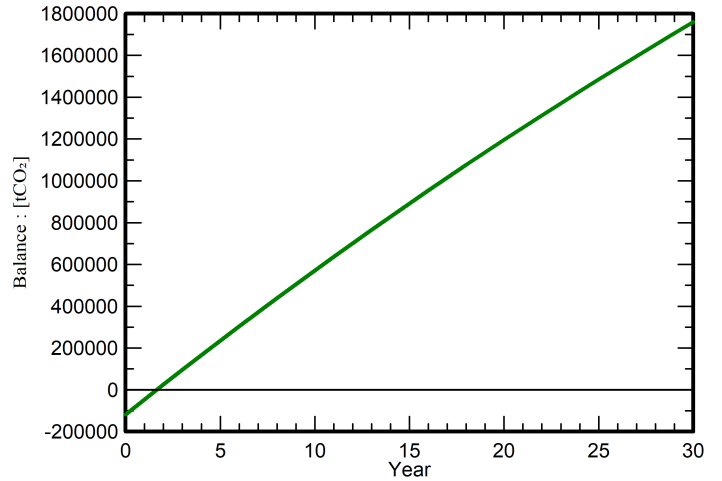
Source: IEA List

Country: Zimbabwe

Lifetime: 30 years

Annual degradation: 1.0 %

**Saved CO<sub>2</sub> Emission vs. Time**



**System Lifecycle Emissions Details**

Item	LCE	Quantity	Subtotal
			[kgCO <sub>2</sub> ]
Modules	1713 kgCO <sub>2</sub> /kWp	56722 kWp	97148219
Supports	4.40 kgCO <sub>2</sub> /kg	4848000 kg	21341866
Inverters	436 kgCO <sub>2</sub> /units	249 units	108596