

PVsyst - Simulation report

Grid-Connected System

Project: Projets Solaires St Pourcain sur Sioule

Variant: Ville Ombrière

Unlimited sheds

System power: 241 kWp

Saint-Pourçain-sur-Sioule - France

Auteur

TECSOL S.A. (France)



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PVsyst V7.3.1

VC1, Simulation date:
02/02/23 11:08
with v7.3.1

Project summary

Geographical Site		Situation		Project settings	
Saint-Pourçain-sur-Sioule		Latitude	46.31 °N	Albedo	0.20
France		Longitude	3.29 °E		
		Altitude	240 m		
		Time zone	UTC+1		
Meteo data					
Saint-Pourçain-sur-Sioule					
Meteonorm 8.1 (1996-2015), Sat=100 % - Synthétique					

System summary

Grid-Connected System		Unlimited sheds		User's needs	
PV Field Orientation		Near Shadings		Unlimited load (grid)	
Sheds		Mutual shadings of sheds			
Tilt	9 °				
Azimuth	-44 °				
System information					
PV Array					
Nb. of modules	588 units	Inverters		4 units	
Pnom total	241 kWp	Nb. of units		200 kWac	
		Pnom total		1.205	
		Pnom ratio			

Results summary

Produced Energy	285423 kWh/year	Specific production	1184 kWh/kWp/year	Perf. Ratio PR	87.67 %
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General parameters

Grid-Connected System		Unlimited sheds		Models used	
PV Field Orientation		Sheds configuration			
Orientation		Nb. of sheds		Transposition Perez	
Sheds		4 units		Diffuse Perez, Meteonorm	
Tilt	9 °	Unlimited sheds		Circumsolar separate	
Azimuth	-44 °	Sizes			
		Sheds spacing 17.5 m			
		Collector width 12.2 m			
		Ground Cov. Ratio (GCR) 69.7 %			
		Top inactive band 0.02 m			
		Bottom inactive band 0.02 m			
		Shading limit angle			
		Limit profile angle 19.4 °			
Horizon		Near Shadings		User's needs	
Average Height	1.5 °	Mutual shadings of sheds		Unlimited load (grid)	

PV Array Characteristics

PV module		Inverter	
Manufacturer	Longi Solar	Manufacturer	Huawei Technologies
Model	LR5-54HPH-410M	Model	SUN2000-50KTL-M3-400V
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	410 Wp	Unit Nom. Power	50.0 kWac
Number of PV modules	588 units	Number of inverters	4 units
Nominal (STC)	241 kWp	Total power	200 kWac
Array #1 - Champ PV		Array #1 - Champ PV	
Number of PV modules	504 units	Number of inverters	12 * MPPT 25% 3 units
Nominal (STC)	207 kWp	Total power	150 kWac
Modules	24 Strings x 21 In series	Operating voltage	200-1000 V
At operating cond. (50°C)		Max. power (=>35°C)	55.0 kWac
Pmpp	189 kWp	Pnom ratio (DC:AC)	1.38
U mpp	593 V		
I mpp	319 A		
Array #2 - Sous-champ #2		Array #2 - Sous-champ #2	
Number of PV modules	84 units	Number of inverters	4 * MPPT 25% 1 unit
Nominal (STC)	34.4 kWp	Total power	50.0 kWac
Modules	4 Strings x 21 In series	Operating voltage	200-1000 V
At operating cond. (50°C)		Max. power (=>35°C)	55.0 kWac
Pmpp	31.5 kWp	Pnom ratio (DC:AC)	0.69
U mpp	593 V		
I mpp	53 A		
Total PV power		Total inverter power	
Nominal (STC)	241 kWp	Total power	200 kWac
Total	588 modules	Number of inverters	4 units
Module area	1148 m ²	Pnom ratio	1.21
Cell area	1058 m ²	Power sharing defined	



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Array losses

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 20.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

Module Quality Loss

Loss Fraction -0.3 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

Incidence effect (IAM): User defined profile

0°	25°	45°	60°	65°	70°	75°	80°	90°
1.000	1.000	0.995	0.962	0.936	0.903	0.851	0.754	0.000

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - Champ PV

Global array res. 31 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sous-champ #2

Global array res. 185 mΩ
Loss Fraction 1.5 % at STC



Horizon definition

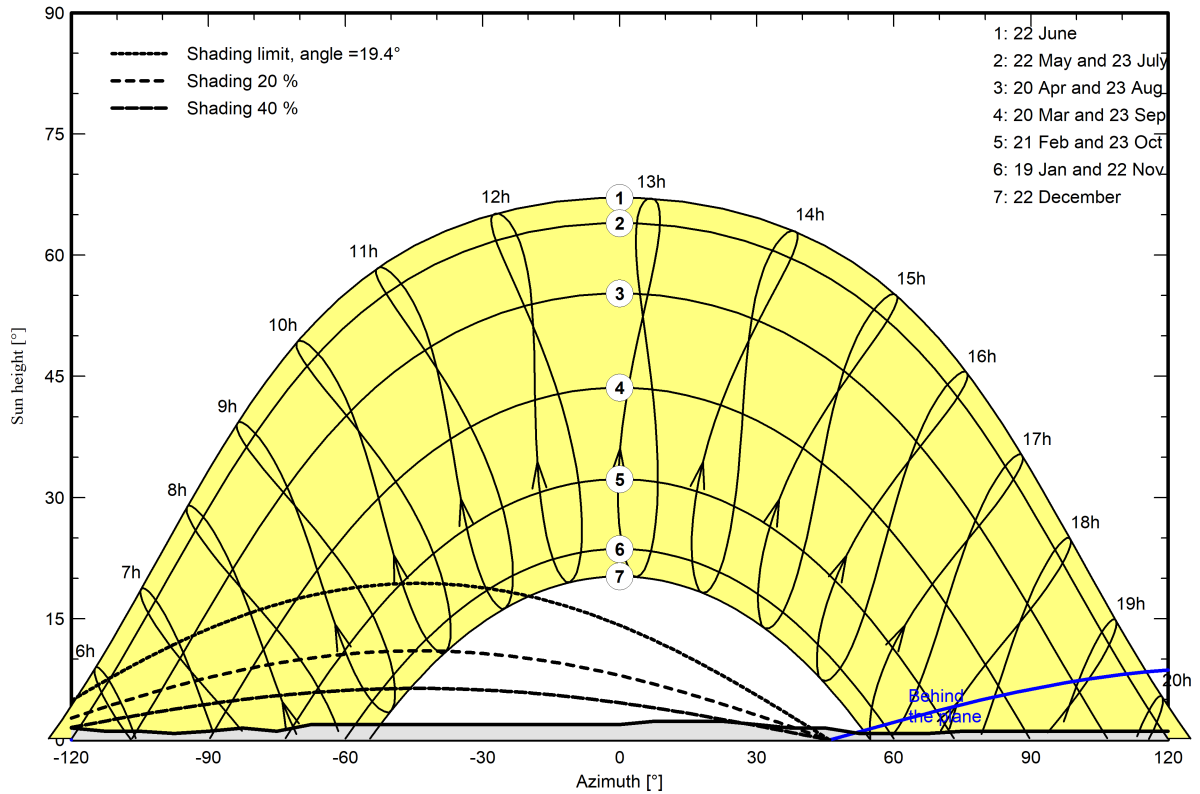
Horizon from PVGIS website API, Lat=46°18'31', Long=3°17'17', Alt=240m

Average Height	1.5 °	Albedo Factor	0.91
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-128	-120	-113	-105	-98	-90	-83	-75	-68
Height [°]	0.8	1.5	1.9	1.9	1.5	1.1	1.1	0.8	1.1	1.5	1.1	1.9
Azimuth [°]	0	8	23	30	38	45	53	68	75	165	173	180
Height [°]	1.9	2.3	2.3	1.9	1.5	1.5	0.8	0.8	1.1	1.1	0.8	0.8

Sun Paths (Height / Azimuth diagram)





Main results

System Production

Produced Energy 285423 kWh/year

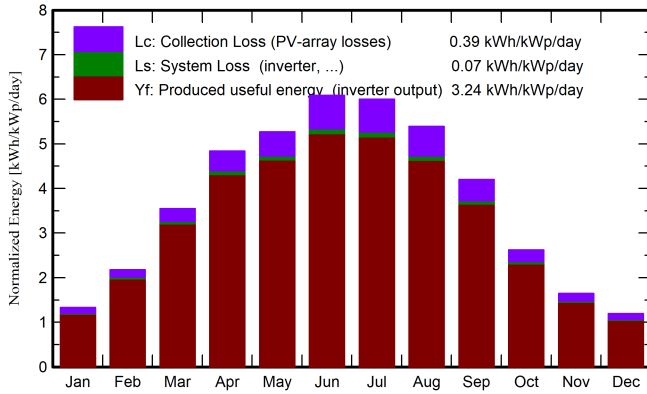
Specific production

1184 kWh/kWp/year

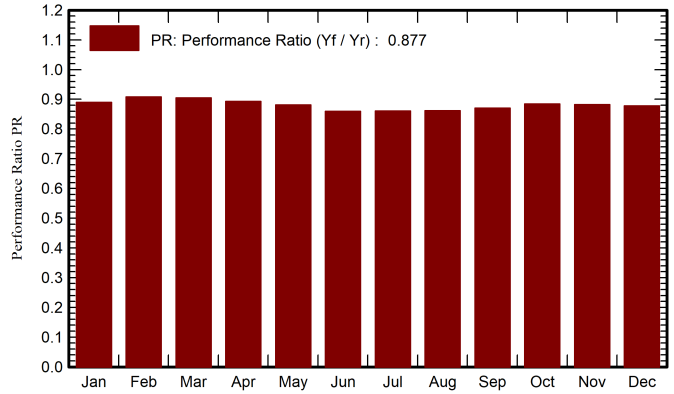
Performance Ratio PR

87.67 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray kWh	E_Grid kWh	PR ratio
January	35.7	20.54	3.55	41.3	38.2	9047	8852	0.890
February	54.4	28.52	3.84	61.0	57.6	13624	13349	0.908
March	102.6	50.67	7.37	109.9	105.9	24451	23980	0.905
April	138.8	67.66	10.46	145.2	140.8	31852	31239	0.893
May	160.7	86.25	14.42	163.5	158.8	35398	34718	0.881
June	180.6	74.30	18.53	182.7	178.2	38649	37867	0.860
July	183.6	89.53	20.40	186.2	181.3	39384	38615	0.860
August	161.9	72.18	19.93	167.1	162.4	35391	34695	0.861
September	118.0	42.89	15.58	126.0	122.0	26981	26450	0.871
October	74.4	39.64	12.32	81.3	77.3	17658	17322	0.884
November	42.4	20.92	7.22	49.4	45.8	10722	10500	0.882
December	31.2	16.59	4.35	37.0	33.9	8013	7836	0.878
Year	1284.3	609.72	11.55	1350.4	1302.3	291171	285423	0.877

Legends

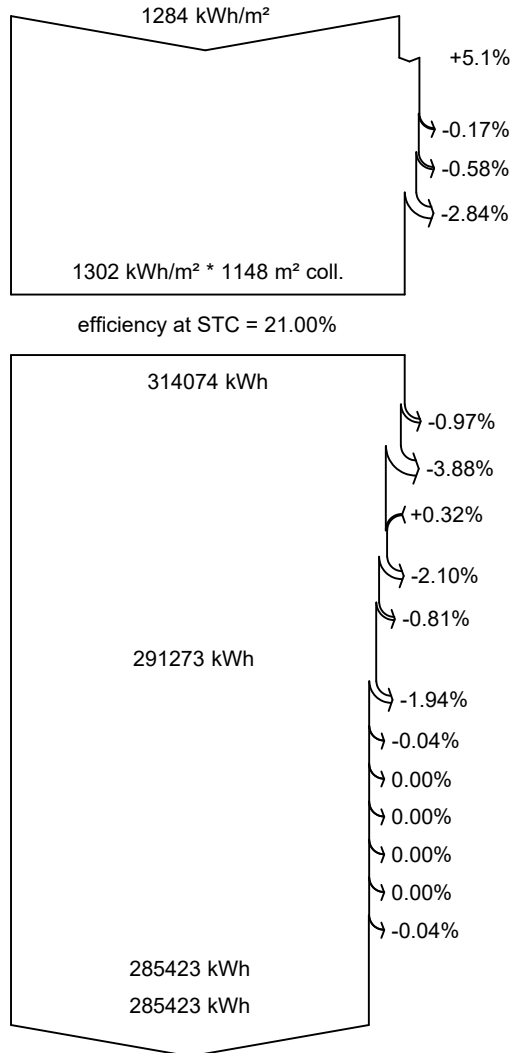
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

Near Shadings: irradiance loss

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

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

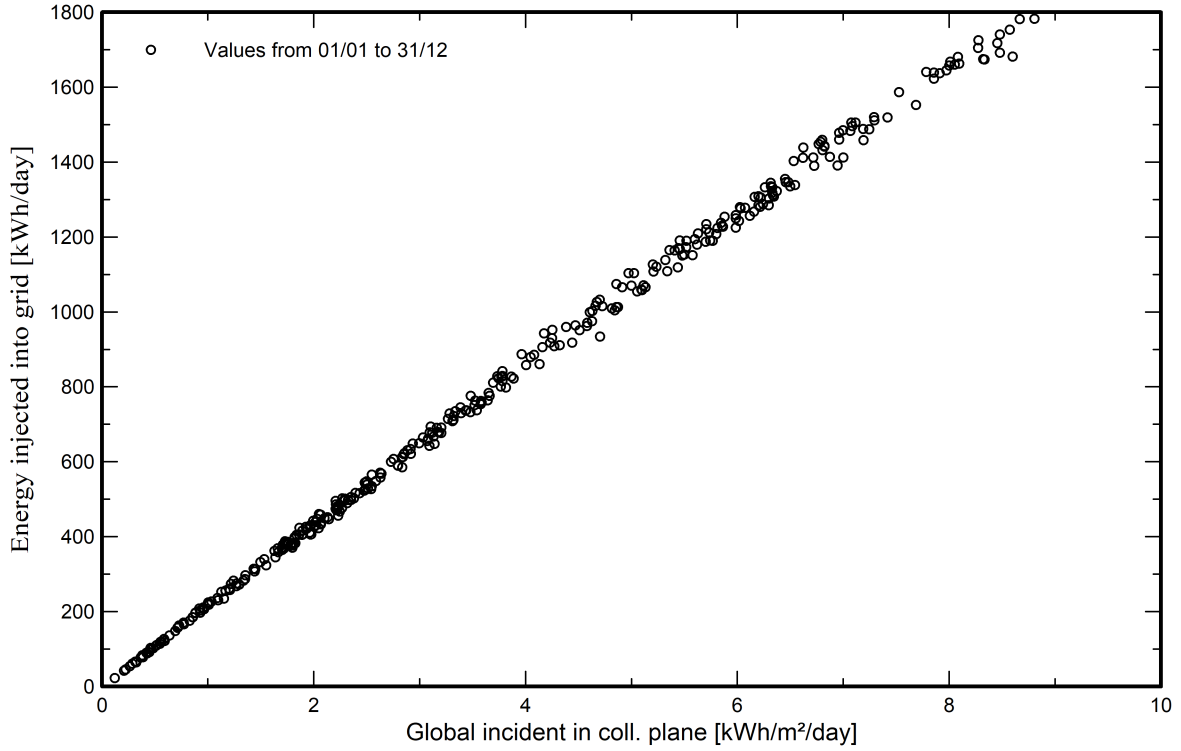
Available Energy at Inverter Output

Energy injected into grid

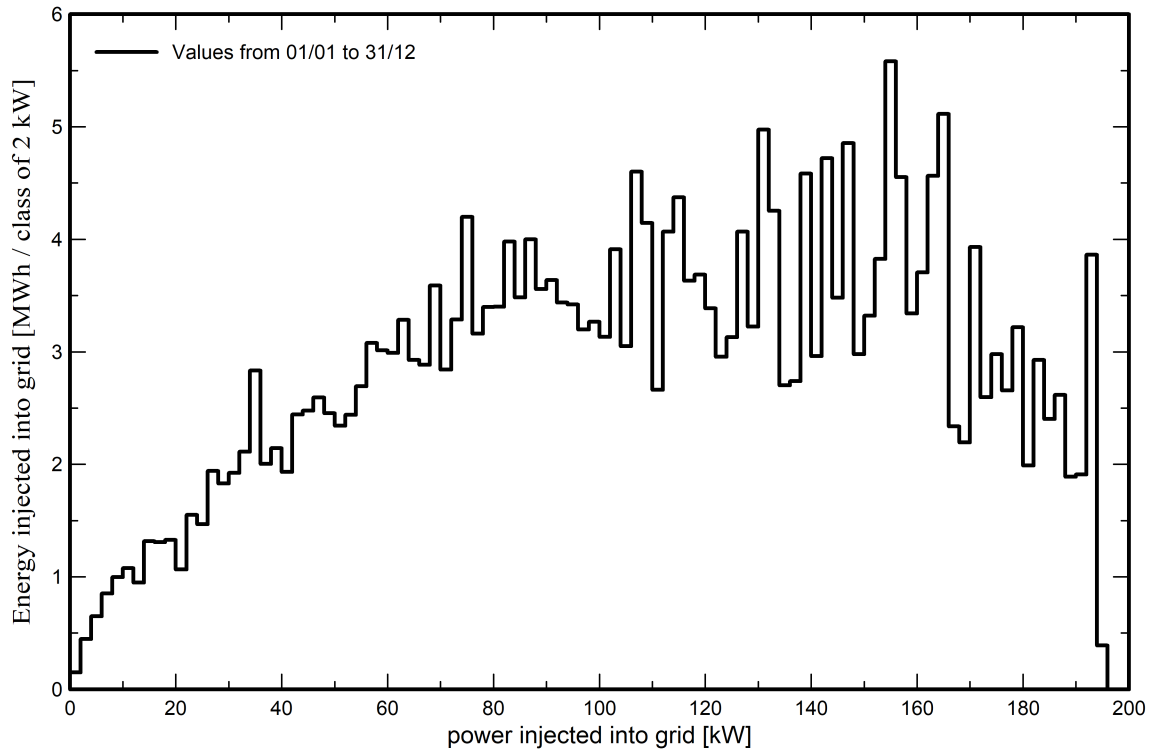


Predef. graphs

Diagramme d'entrée/sortie journalier



Distribution de la puissance de sortie système

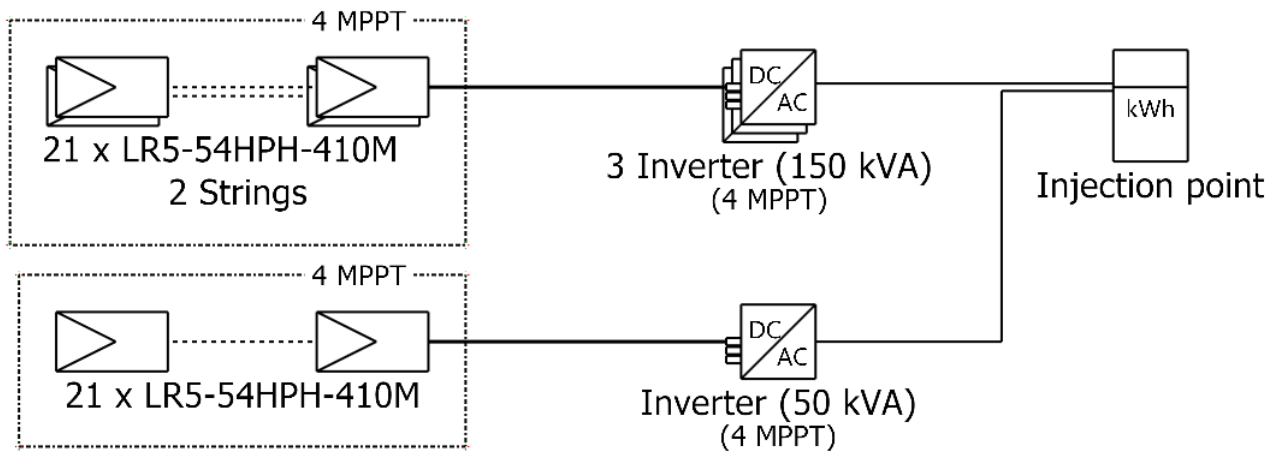




Single-line diagram

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PV module	LR5-54HPH-410M
Inverter	SUN2000-50KTL-M3-400V
String	21 x LR5-54HPH-410M

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Sioule

TECSOL S.A. (Fran

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