



COMUNE DI LECCE



REGIONE PUGLIA



PROVICIA DI LECCE

AUTORIZZAZIONE UNICA AI SENSI DEL DLGS 29/12/2003 N.387 RELATIVA ALLA COSTRUZIONE ED ESERCIZIO DI UN IMPIANTO DI PRODUZIONE DELL'ENERGIA ELETTRICA DA FONTE FOTOVOLTAICA AVENTE POTENZA IN IMMISSIONE PARI A 9.25 MW E POTENZA MODULI PARI A 10.39 MW CON RELATIVO COLLEGAMENTO ALLA RETE ELETTRICA - IMPIANTO SPOT 24 UBICATO IN AGRO DI LECCE IN CONTRADA CASE BIANCHE DISTINTO AL N.C.E.U. AL FG. 106 PARTICELLE 29-45-46-47-116-141-170-214-216-218-221-223

Proponente:

**HEPV 09 s.r.l.**

Via Alto Adige n°160  
38121 Trento (TN)  
P.IVA 02550360222  
Legale Rappresentante: Gianni Bosin

Spazio riservato agli Enti:

5					
4					
3					
2					
1					
0	14.12.2019	G.Abatemattei	Giuseppe Elia	Giuseppe Elia	AUTORIZZAZIONE UNICA SPOT 24
Em./Rev.	Data	Red./Dis.	Verificato	Approvato	Descrizione

Descrizione elaborato :

**PRODUZIONE DI ENERGIA**

Cod. N°:

ELABORATO

**RS\_13.01**

Scala

- : -



L.L. Engineering Srls

Progettazione:

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## Grid-Connected System: Simulation parameters

**Project :** **20190923 HE190024\_HEPV**

<b>Geographical Site</b>	<b>Lecce</b>	<b>Country</b>	<b>Italy</b>
<b>Situation</b>	Latitude 40.35° N	Longitude	18.17° E
Time defined as	Legal Time Time zone UT+1	Altitude	51 m
<b>Meteo data:</b>	<b>Lecce</b>	PVGIS: CMSAF, SARAH or NSRDB - Synthetic	

**Simulation variant :** **HEPV29 - Sviluppo SPOT24 da 10.3936MWp**

Simulation date 09/12/19 16h30

<b>Simulation parameters</b>	System type	<b>Trackers single array, with backtracking</b>	
<b>Tracking plane, tilted Axis</b>	Axis Tilt	0°	Axis Azimuth 0°
Rotation Limitations	Minimum Phi	-60°	Maximum Phi 60°
	Tracking algorithm	Astronomic calculation	
<b>Backtracking strategy</b>	Nb. of trackers	55	Single array
	Tracker Spacing	5.50 m	Collector width 2.00 m
Inactive band	Left	0.02 m	Right 0.02 m
Backtracking limit angle	Phi limits	+/- 68.0°	Ground cov. Ratio (GCR) 36.4 %
<b>Models used</b>	Transposition	Perez	Diffuse Perez, Meteororm
<b>Horizon</b>	Free Horizon		
<b>Near Shadings</b>	Linear shadings		
<b>User's needs :</b>	Unlimited load (grid)		

### PV Array Characteristics

<b>PV module</b>	Si-poly	Model	<b>CS3W-400P 1500VHE</b>	
Custom parameters definition	Manufacturer	Canadian Solar Inc.		
Number of PV modules	In series	28 modules	In parallel	928 strings
Total number of PV modules	Nb. modules	25984	Unit Nom. Power	400 Wp
Array global power	Nominal (STC)	<b>10394 kWp</b>	At operating cond.	9434 kWp (50°C)
Array operating characteristics (50°C)	U mpp	982 V	I mpp	9602 A
Total area	Module area	<b>57403 m²</b>	Cell area	51561 m²

<b>Inverter</b>	Model	<b>SUN2000-185KTL-H1-40C-Preliminary-v0.2</b>		
Custom parameters definition	Manufacturer	Huawei Technologies		
Characteristics	Operating Voltage	500-1500 V	Unit Nom. Power	175 kWac
			Max. power (=>30°C)	185 kWac
Inverter pack	Nb. of inverters	50 units	Total Power	8750 kWac
			Pnom ratio	1.19

### PV Array loss factors

Array Soiling Losses		Loss Fraction	2.0 %
Thermal Loss factor	Uc (const)	37.7 W/m²K	Uv (wind) 0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	1.7 mOhm	Loss Fraction 1.5 % at STC
LID - Light Induced Degradation			Loss Fraction 0.8 %
Module Quality Loss			Loss Fraction -0.3 %
Module Mismatch Losses			Loss Fraction 1.0 % at MPP
Strings Mismatch loss			Loss Fraction 0.10 %

### Grid-Connected System: Simulation parameters

Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
1.000	1.000	1.000	0.990	0.990	0.970	0.920	0.760	0.000

**System loss factors**

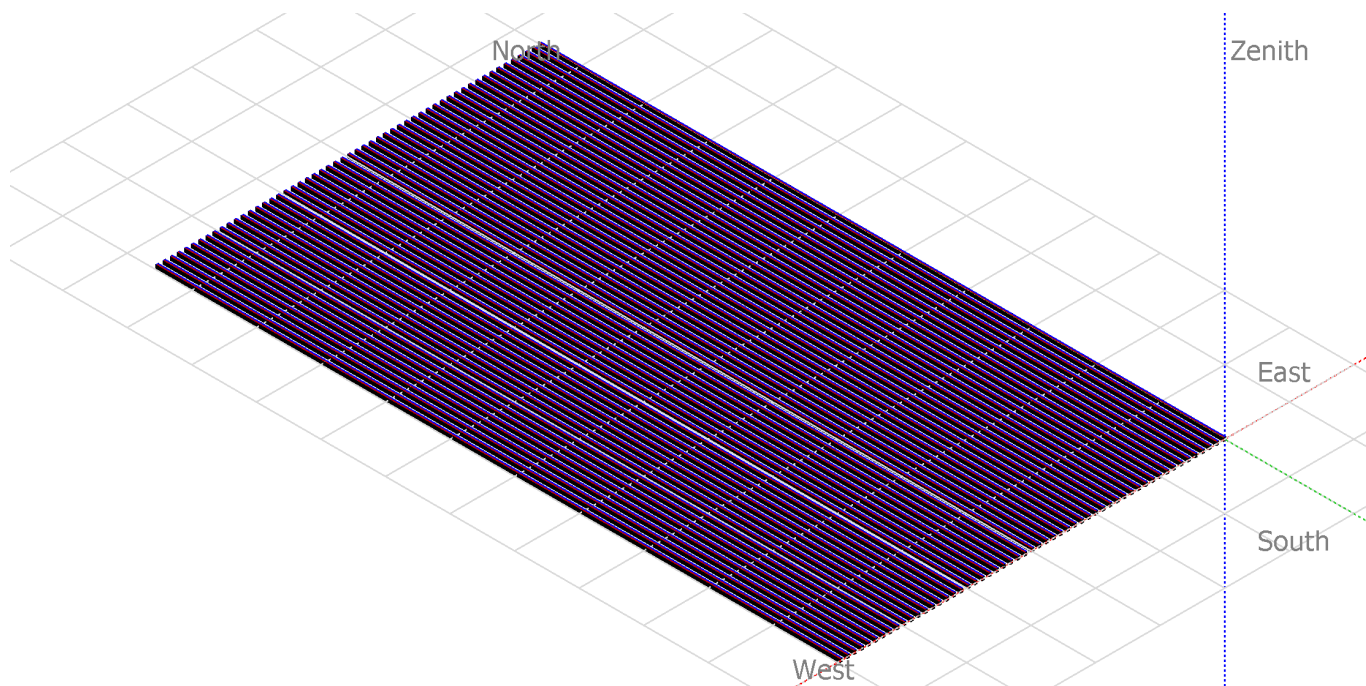
AC wire loss inverter to transfo	Inverter voltage	800 Vac tri	
	Wires: 3x5000.0 mm <sup>2</sup>	249 m	Loss Fraction 1.5 % at STC
External transformer	Iron loss (24H connexion)	10264 W	Loss Fraction 0.1 % at STC
	Resistive/Inductive losses	0.624 mOhm	Loss Fraction 1.0 % at STC
Unavailability of the system	3.6 days, 3 periods		Time fraction 1.0 %
Auxiliaries loss	Proportionnal to Power	4.0 W/kW ... from Power thresh.	0.0 kW

## Grid-Connected System: Near shading definition

**Project :** 20190923 HE190024\_HEPV  
**Simulation variant :** HEPV29 - Sviluppo SPOT24 da 10.3936MWp

<b>Main system parameters</b>	System type	<b>Trackers single array, with backtracking</b>	
<b>Near Shadings</b>	Linear shadings		
PV Field Orientation	tracking, tilted axis, Axis Tilt	0°	Axis Azimuth 0°
PV modules	Model	CS3W-400P 1500VHE	Pnom 400 Wp
PV Array	Nb. of modules	25984	Pnom total <b>10394 kWp</b>
Inverter	SUN2000-185KTL-H1-40C-Preliminary-v0.2		Pnom 175 kW ac
Inverter pack	Nb. of units	50.0	Pnom total <b>8750 kW ac</b>
User's needs	Unlimited load (grid)		

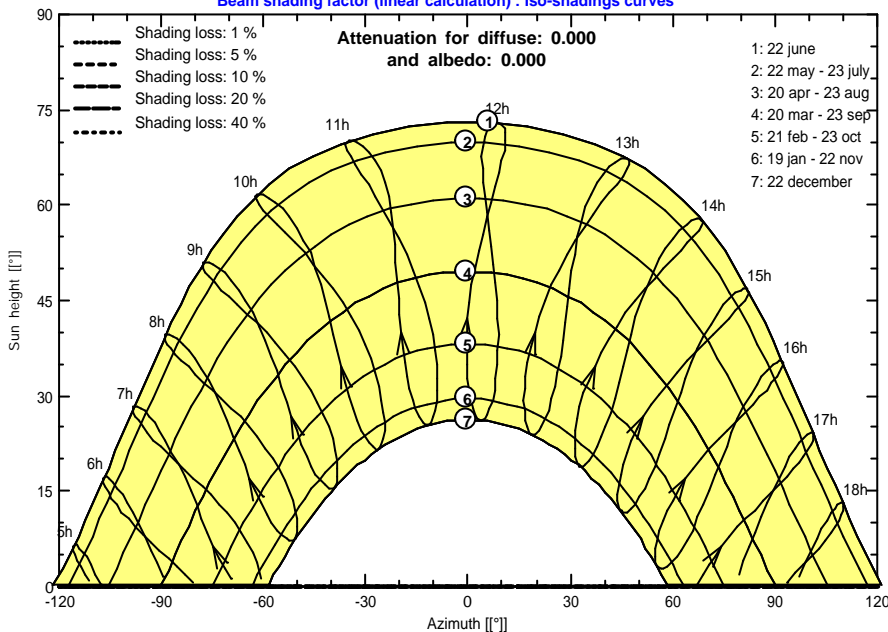
**Perspective of the PV-field and surrounding shading scene**



**Iso-shadings diagram**

20190923 HE190024\_HEPV

Beam shading factor (linear calculation) : Iso-shadings curves



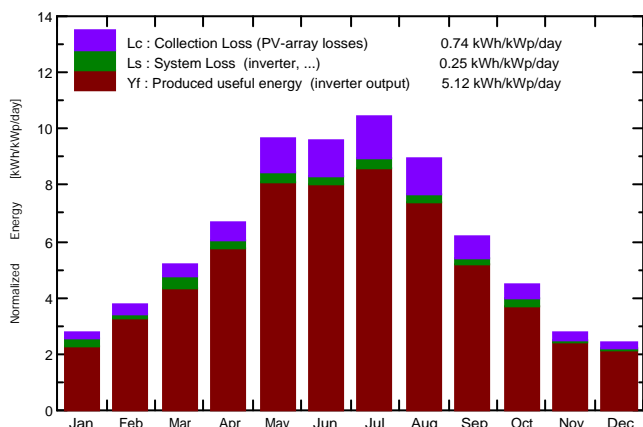
## Grid-Connected System: Main results

**Project :** 20190923 HE190024\_HEPV  
**Simulation variant :** HEPV29 - Sviluppo SPOT24 da 10.3936MWp

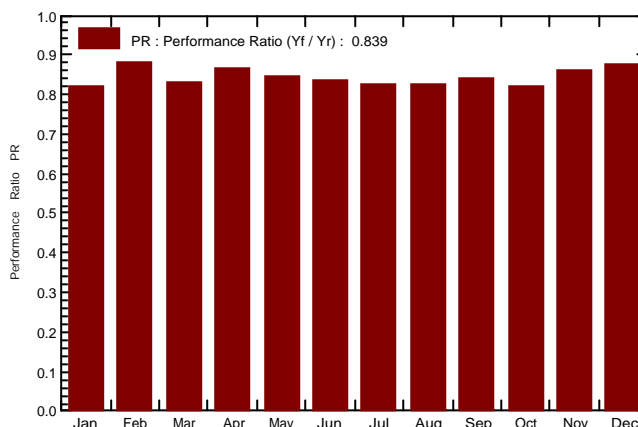
<b>Main system parameters</b>		System type	<b>Trackers single array, with backtracking</b>	
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Inverter	SUN2000-185KTL-H1-40C-Preliminary-v0.2		Pnom	175 kW ac
Inverter pack	Nb. of units	50.0	Pnom total	<b>8750 kW ac</b>
User's needs	Unlimited load (grid)			

**Main simulation results**  
 System Production **Produced Energy 19434 MWh/year** Specific prod. 1870 kWh/kWp/year  
 Performance Ratio PR **83.86 %**

**Normalized productions (per installed kWp): Nominal power 10394 kWp**



**Performance Ratio PR**



### HEPV29 - Sviluppo SPOT24 da 10.3936MWp 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	E_Grid MWh	PR
January	64.5	28.30	9.24	87.5	81.3	831	744	0.818
February	78.9	36.30	10.50	105.5	98.2	998	964	0.879
March	123.4	53.40	10.81	162.0	152.0	1531	1396	0.829
April	152.8	60.70	14.80	201.3	189.9	1876	1808	0.864
May	221.7	66.30	19.52	298.5	283.3	2721	2617	0.844
June	217.3	72.50	22.51	288.2	272.9	2601	2503	0.836
July	238.9	64.30	25.81	324.0	307.9	2884	2773	0.824
August	204.9	60.70	26.55	277.3	263.1	2467	2374	0.823
September	141.0	57.70	21.42	185.5	174.6	1679	1617	0.839
October	103.4	44.10	16.55	138.7	129.8	1284	1185	0.822
November	64.9	33.90	14.46	84.7	78.2	784	757	0.860
December	56.5	26.60	9.05	76.5	70.6	722	697	0.876
Year	1668.2	604.80	16.80	2229.7	2101.9	20377	19434	0.839

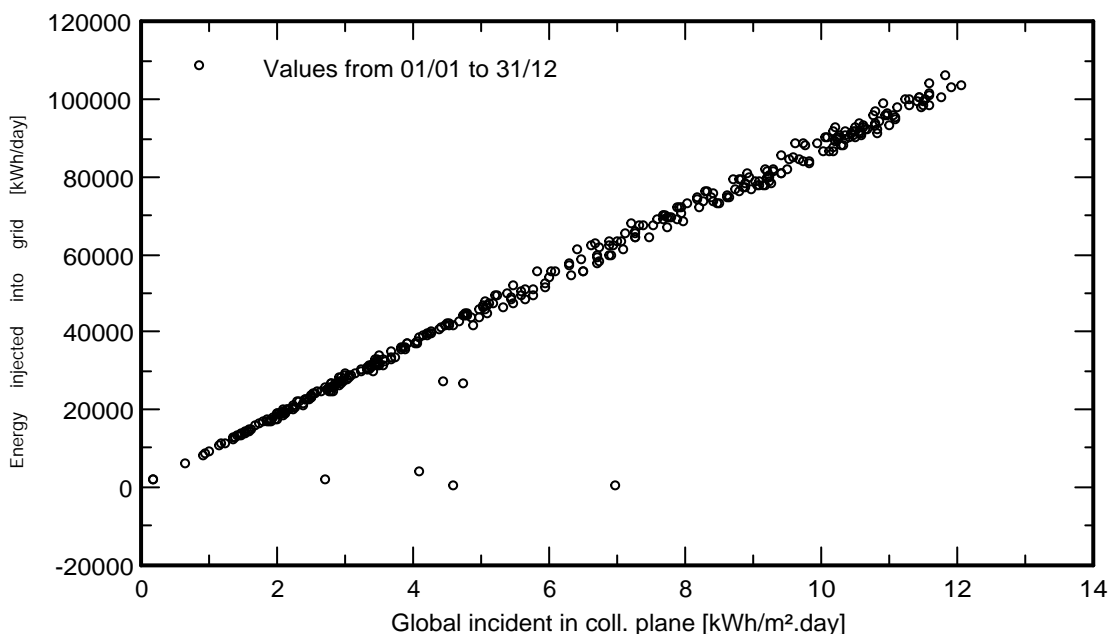
Legends:	GlobHor	Horizontal global irradiation	GlobEff	Effective Global, corr. for IAM and shadings
	DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
	T_Amb	T amb.	E_Grid	Energy injected into grid
	GlobInc	Global incident in coll. plane	PR	Performance Ratio

## Grid-Connected System: Special graphs

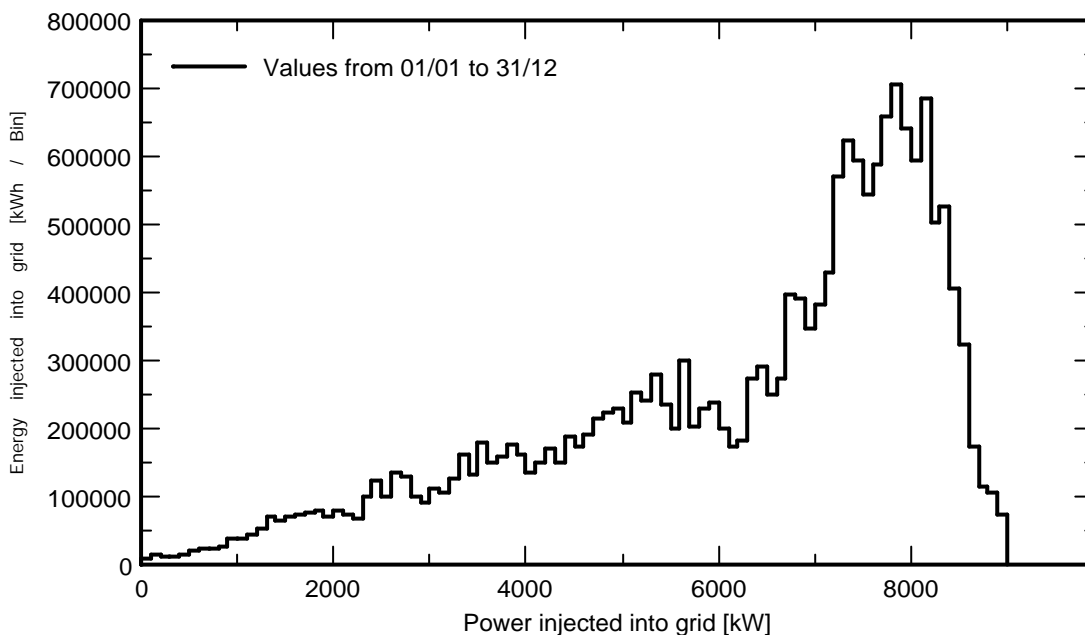
**Project :** 20190923 HE190024\_HEPV  
**Simulation variant :** HEPV29 - Sviluppo SPOT24 da 10.3936MWp

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### Daily Input/Output diagram



### Distribuzione potenza in uscita sistema



## Grid-Connected System: Loss diagram

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**Simulation variant :** HEPV29 - Sviluppo SPOT24 da 10.3936MWp

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PV modules	Model	CS3W-400P 1500VHE	Pnom 400 Wp
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Inverter	SUN2000-185KTL-H1-40C-Preliminary-v0.2		Pnom 175 kW ac
Inverter pack	Nb. of units	50.0	Pnom total <b>8750 kW ac</b>
User's needs	Unlimited load (grid)		

**Loss diagram over the whole year**

