



Committente:

ENERGY AQUARIUS SRL

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Progetto definitivo:

PROVVEDIMENTO AUTORIZZATIVO UNICO REGIONALE ai sensi dell' art. 27 bis del D.Lgs. 152/06 e del D.M. 52/2015

Denominazione progetto:

IMPIANTO FOTOVOLTAICO "CARPI-Fossoli" di potenza 23,20 MWp con annesso SISTEMA DI ACCUMULO (BESS) di potenza 15 MWp

Sito in:

COMUNE DI CARPI (MO)

Titolo elaborato:

Stima di producibilità dell'impianto

Elaborato: T-6

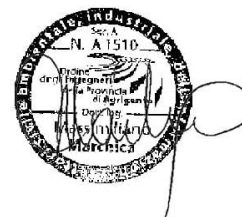
Scala -



Responsabile Coordinamento progetto : dott. for. Edoardo Pio Iurato

TIMBRI E FIRME:

Progettisti : Ing. Massimiliano Marchica



Collaboratori : Dott. Matteo Pradotto

REV.:	REDAZIONE:	CONTROLLO:	APPROVAZIONE :	DATA:
00	Matteo Pradotto	Massimiliano Marchica	Massimiliano Marchica	13/05/2024
01				
02				
03				
04				
05				

FIRMA/TIMBRO
COMMITTENTE:

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PVsyst - Simulation report

Grid-Connected System

Project: Carpi

Variant: DEF

Tracking system

System power: 23.20 MWp

Goldoni - Italia

Author

flyRen Development srl (Italy)

**PVsyst V7.4.6**

VC4, Simulation date:
10/05/24 12:28
with V7.4.6

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Project summary**Geographical Site**

Goldoni
Italia

Situation

Latitude 44.85 °N
Longitude 10.91 °E
Altitude 21 m
Time zone UTC+1

Project settings

Albedo 0.20

Weather data

Goldoni
Meteonorm 8.1 (1991-2012), Sat=100% - Sintetico

System summary**Grid-Connected System****PV Field Orientation****Orientation**

Tracking plane, tilted axis

Avg axis tilt 0 °

Avg axis azim. 0 °

Tracking system**Tracking algorithm**

Astronomic calculation

Near Shadings

Linear shadings : Slow (simul.)

Diffuse shading Automatic

System information**PV Array**

Nb. of modules 33628 units

Pnom total 23.20 MWp

Inverters

Nb. of units 60 units

Pnom total 19.80 MWac

Pnom ratio 1.172

User's needs

Unlimited load (grid)

Results summary

Produced Energy	34514313 kWh/year	Specific production	1487 kWh/kWp/year	Perf. Ratio PR	81.67 %
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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Tracking plane, tilted axis

Avg axis tilt 0 °

Avg axis azim. 0 °

Models used

Transposition Perez

Diffuse Perez, Meteorism

Circumsolar separate

Horizon

Free Horizon

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 5.00 m

Tracker width 2.38 m

GCR 47.7 %

Axis height above ground 2.10 m

Tracking system

Tracking algorithm

Astronomic calculation

Near Shadings

Linear shadings : Slow (simul.)

Diffuse shading Automatic

Trackers configuration

Nb. of trackers 1281 units

Sizes

Tracker Spacing 5.00 m

Collector width 2.38 m

Ground Cov. Ratio (GCR) 47.7 %

Phi min / max. -/+ 60.0 °

Shading limit angles

Phi limits for BT -/+ 61.3 °

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer CSI Solar Co., Ltd.

Model CS7N-690TB-AG 1500V

(Custom parameters definition)

Unit Nom. Power 690 Wp

Number of PV modules 33628 units

Nominal (STC) 23.20 MWp

Modules 1201 string x 28 In series

At operating cond. (50°C)

Pmpp 21.47 MWp

U mpp 1016 V

I mpp 21140 A

Total PV power

Nominal (STC) 23203 kWp

Total 33628 modules

Module area 104460 m²

Inverter

Manufacturer Huawei Technologies

Model SUN2000-330KTL-H1-ENG

(Custom parameters definition)

Unit Nom. Power 330 kWac

Number of inverters 60 units

Total power 19800 kWac

Operating voltage 500-1500 V

Max. power (=>30°C) 330 kWac

Pnom ratio (DC:AC) 1.17

Power sharing within this inverter

Total inverter power

Total power 19800 kWac

Number of inverters 60 units

Pnom ratio 1.17

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Array losses**Array Soiling Losses**

Loss Fraction 5.0 %

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. 0.26 mΩ

Loss Fraction 0.5 % at STC

LID - Light Induced Degradation

Loss Fraction 0.0 %

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

20°	40°	60°	65°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.990	0.960	0.920	0.840	0.720	0.000

System losses**Unavailability of the system**

Time fraction 1.5 %
5.5 days,
3 periods

Auxiliaries loss

Proportionnal to Power 3.0 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 1.39 % at STC

Inverter: SUN2000-330KTL-H1-ENG

Wire section (60 Inv.) Copper 60 x 3 x 240 mm²
Average wires length 300 m

MV line up to Injection

MV Voltage 36 kV
Average each inverter
Wires Alu 3 x 185 mm²
Length 500 m
Loss Fraction 0.02 % at STC

AC losses in transformers**MV transfo**

Medium voltage 36 kV

One transfo parameters

Nominal power at STC 3.80 MVA
Iron Loss (night disconnect) 3.80 kVA
Iron loss fraction 0.10 % at STC
Copper loss 37.97 kVA
Copper loss fraction 1.00 % at STC
Coils equivalent resistance 3 x 1.69 mΩ

Operating losses at STC (full system)

Nb. identical MV transfos 6
Nominal power at STC 22.78 MVA
Iron loss (night disconnect) 22.78 kVA
Copper loss 227.84 kVA



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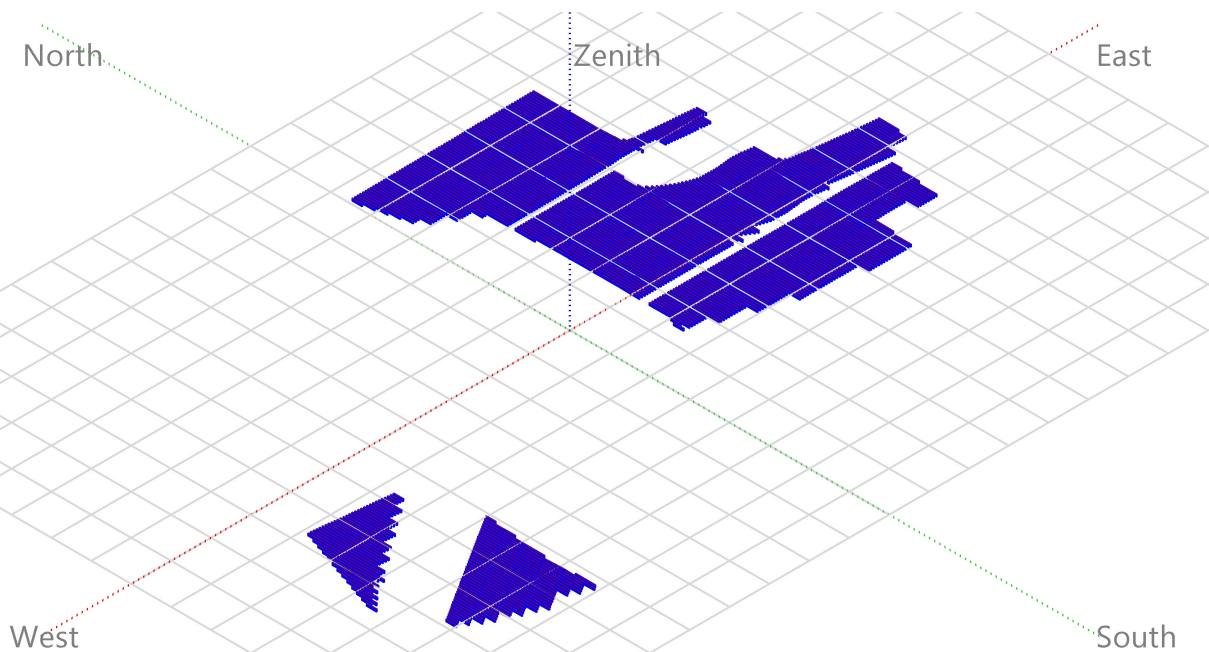
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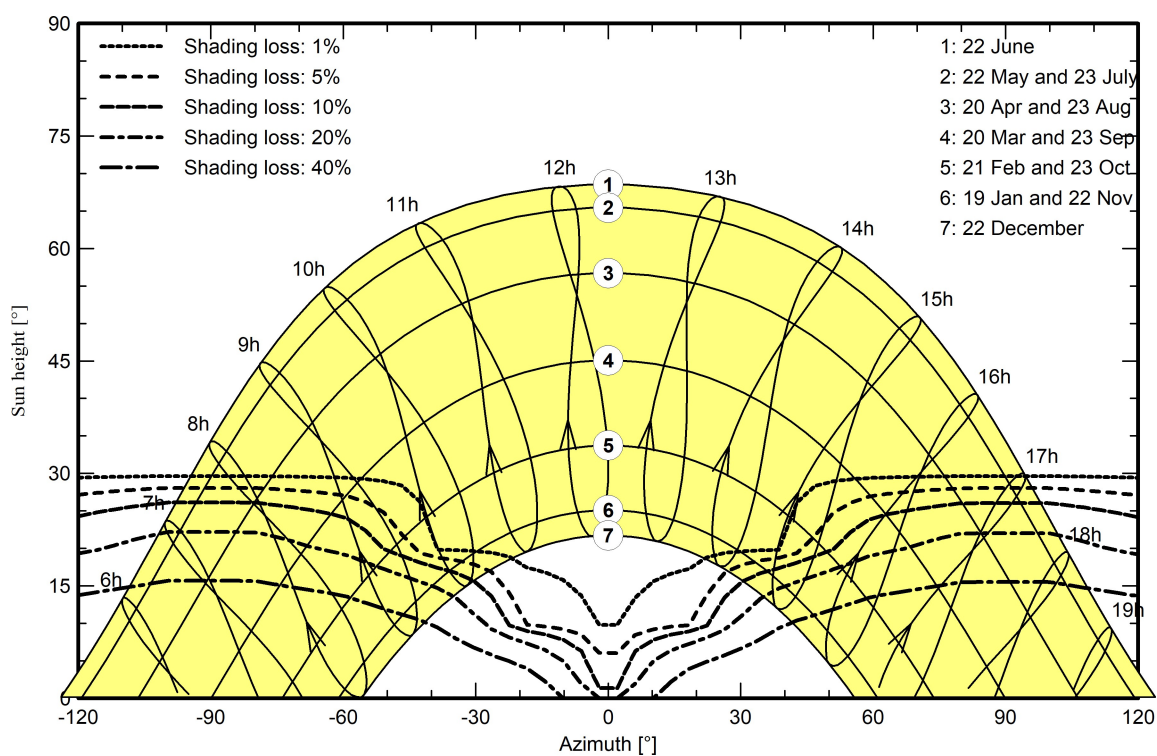
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





PVsyst V7.4.6

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Main results

System Production

Produced Energy 34514313 kWh/year

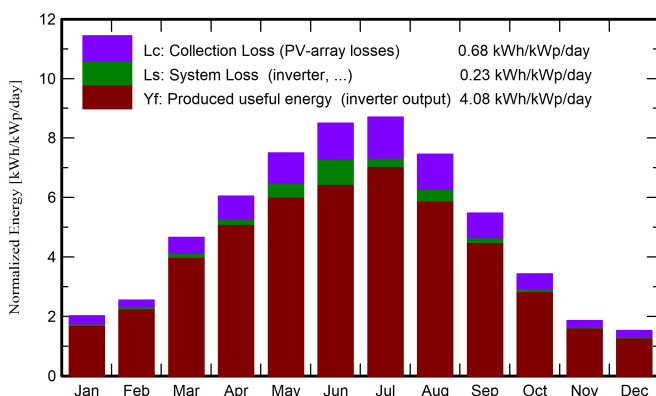
Specific production

1487 kWh/kWp/year

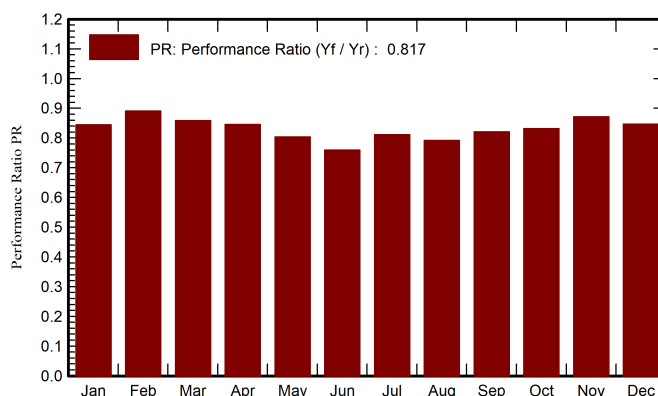
Perf. Ratio PR

81.67 %

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	43.9	23.47	2.57	62.6	51.3	1262595	1227197	0.844
February	55.7	34.35	4.64	71.4	61.8	1519115	1475221	0.890
March	108.1	57.87	9.70	144.3	123.7	2967331	2873972	0.858
April	134.0	63.63	13.79	181.3	157.6	3684161	3556840	0.846
May	175.3	84.95	18.77	232.5	204.0	4682771	4333135	0.803
June	191.6	85.20	23.33	255.0	225.9	5081786	4493921	0.760
July	198.2	78.91	25.89	269.9	237.6	5275161	5079019	0.811
August	169.6	73.28	25.35	231.0	202.1	4521318	4242603	0.792
September	118.9	54.33	19.78	164.2	140.9	3239062	3129281	0.821
October	77.7	41.39	14.90	106.3	89.9	2118053	2051995	0.832
November	43.0	25.71	8.92	55.6	48.0	1159851	1125665	0.872
December	34.0	20.54	3.71	47.1	38.7	952922	925465	0.846
Year	1350.2	643.63	14.33	1821.3	1581.4	36464126	34514313	0.817

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

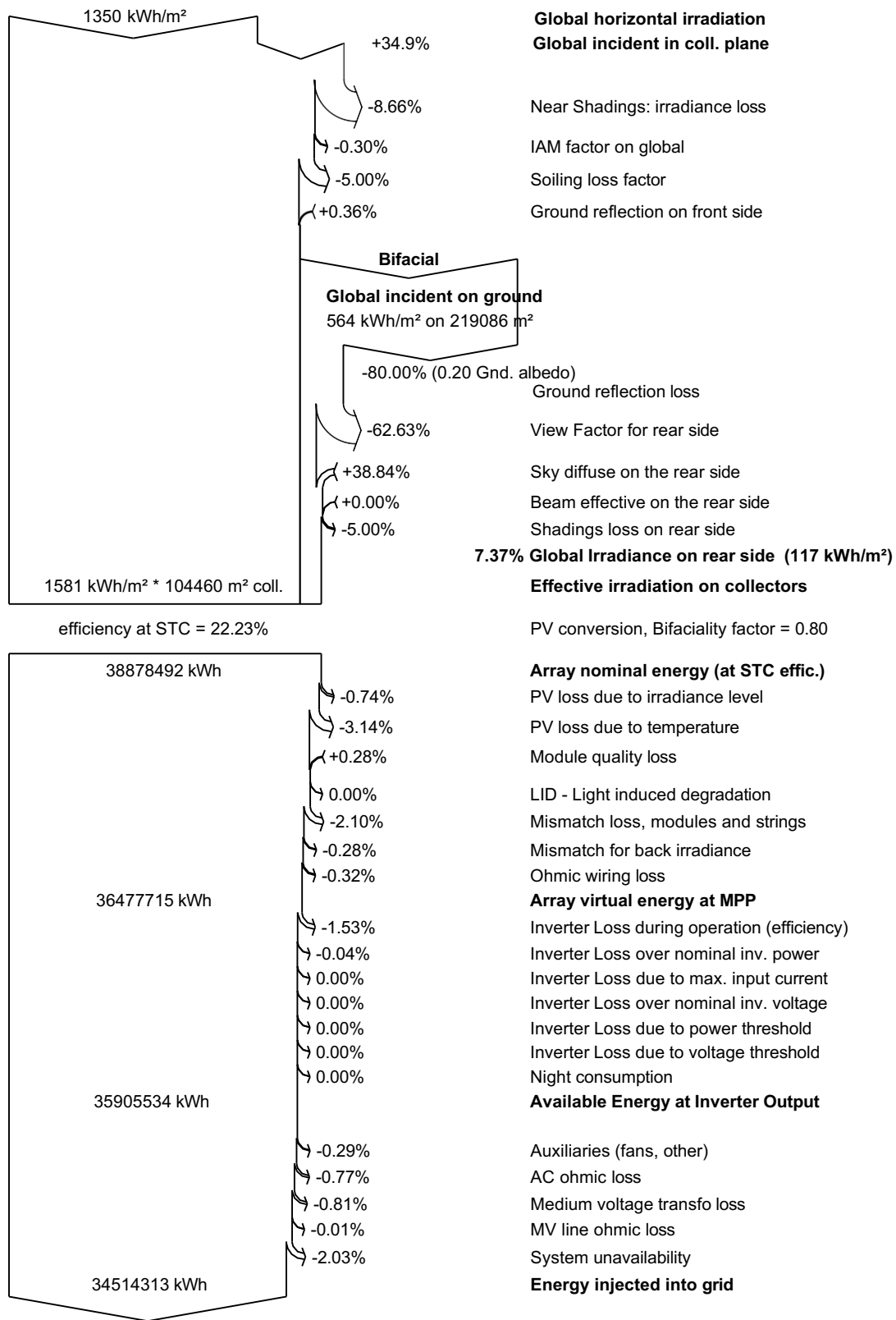
EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



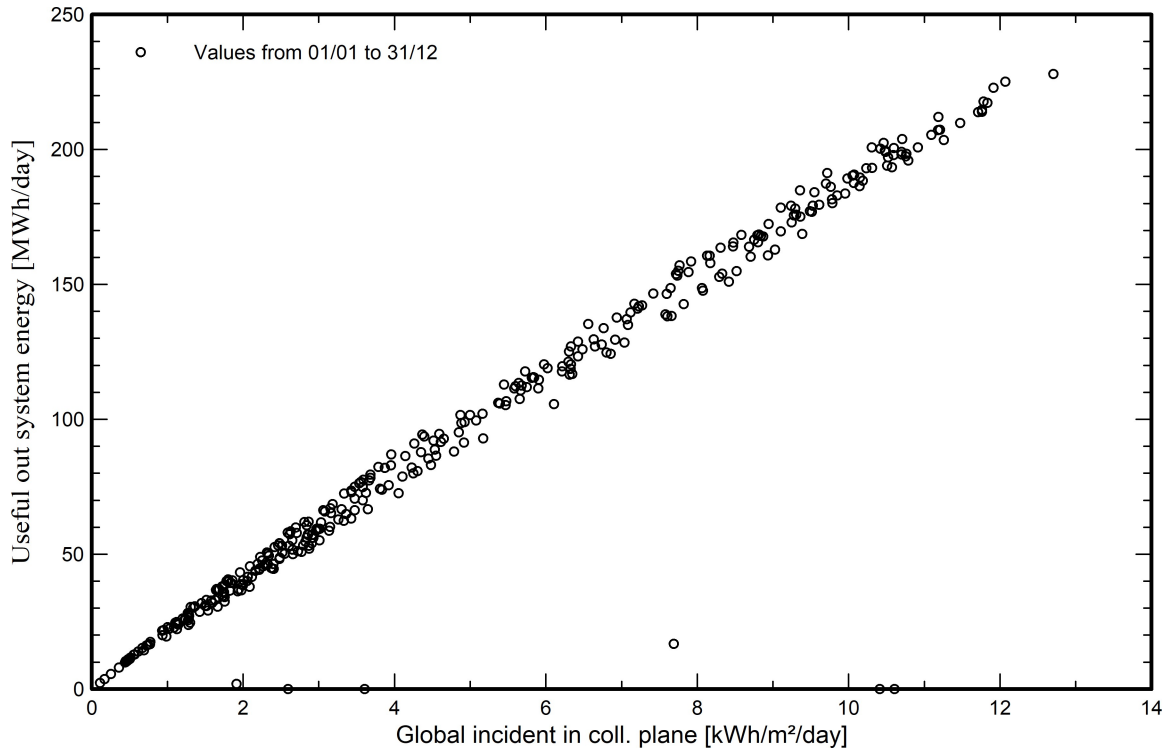
Loss diagram





Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

