Grid-Connected System: Simulation parameters

Project : **Ground Mount, Egypt**

Geographical Site	**Al Giza Desert**		Country	**Egypt**
Situation	Latitude	29.97° N	Longitude	31.14° E
Time defined as	Legal Time	Time zone UT+2	Altitude	15 m
	Albedo	0.20		
Meteo data:	**Al Giza Desert**	Meteonorm 7.2 (1981-2009) - Synthetic		

Simulation variant : **Ground Mount, Egypt**

Simulation date 01/05/22 12h53

Simulation parameters	System type	**Sheds on ground**		
Collector Plane Orientation	Tilt	15°	Azimuth	0°
Sheds configuration	Nb. of sheds	56	Identical arrays	
	Sheds spacing	6.00 m	Collector width	3.95 m
Shading limit angle	Limit profile angle	25.2°	Ground cov. Ratio (GCR)	65.9 %
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	Linear shadings			
User's needs :	Unlimited load (grid)			

PV Array Characteristics

PV module	Si-mono	Model	**TSM-340DD14A(II)**	
Original PVsyst database		Manufacturer	Trina Solar	
Number of PV modules		In series	18 modules	In parallel 120 strings
Total number of PV modules		Nb. modules	2160	Unit Nom. Power 340 Wp
Array global power		Nominal (STC)	**734 kWp**	At operating cond. 663 kWp (50°C)
Array operating characteristics (50°C)		U mpp	614 V	I mpp 1080 A
Total area		Module area	**4191 m²**	Cell area 3767 m²
Inverter		Model	**Sunny Tripower 60-10**	
Original PVsyst database		Manufacturer	SMA	
Characteristics		Operating Voltage	570-800 V	Unit Nom. Power 60.0 kWac
Inverter pack		Nb. of inverters	12 units	Total Power 720 kWac
				Pnom ratio 1.02

PV Array loss factors

Array Soiling Losses — Average loss Fraction 2.3 %

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%

Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	13 mOhm	Loss Fraction	2.0 % at STC
LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	-0.5 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.05

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System loss factors

AC wire loss inverter to transfo	Inverter voltage	400 Vac tri		
	Wires: 3x700.0 mm²	121 m	Loss Fraction	1.5 % at STC
External transformer	Iron loss (24H connexion)	719 W	Loss Fraction	0.1 % at STC
	Resistive/Inductive losses	2.23 mOhm	Loss Fraction	1.0 % at STC
Unavailability of the system	3.6 days, 3 periods		Time fraction	1.0 %

Auxiliaries loss

	constant (fans)	4.00 kW	... from Power thresh.	0.0 kW
	Night auxiliaries consumption	3.00 kW		

Grid-Connected System: Near shading definition

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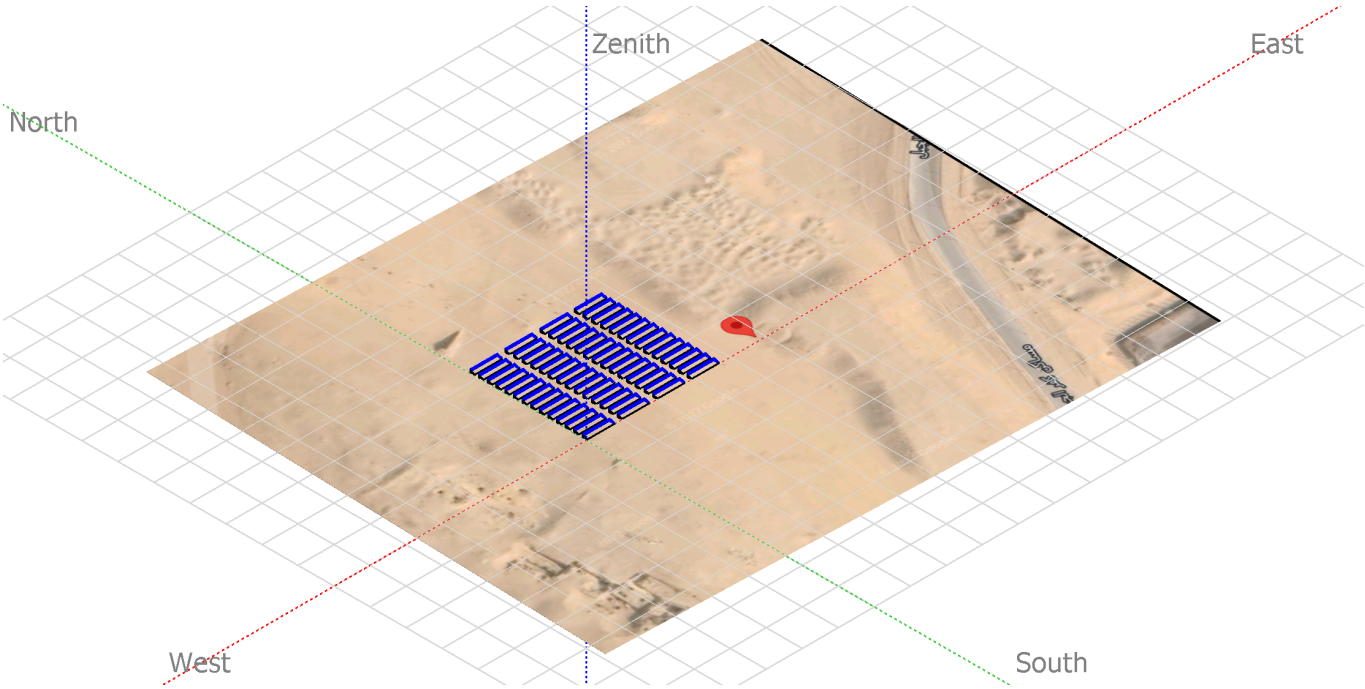
Simulation variant : **Ground Mount, Egypt**

Main system parameters	System type	**Sheds on ground**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	15°	azimuth	0°
PV modules	Model	TSM-340DD14A(II)	Pnom	340 Wp
PV Array	Nb. of modules	2160	Pnom total	**734 kWp**
Inverter	Model	Sunny Tripower 60-10	Pnom	60.0 kW ac
Inverter pack	Nb. of units	12.0	Pnom total	**720 kW ac**
User's needs	Unlimited load (grid)			

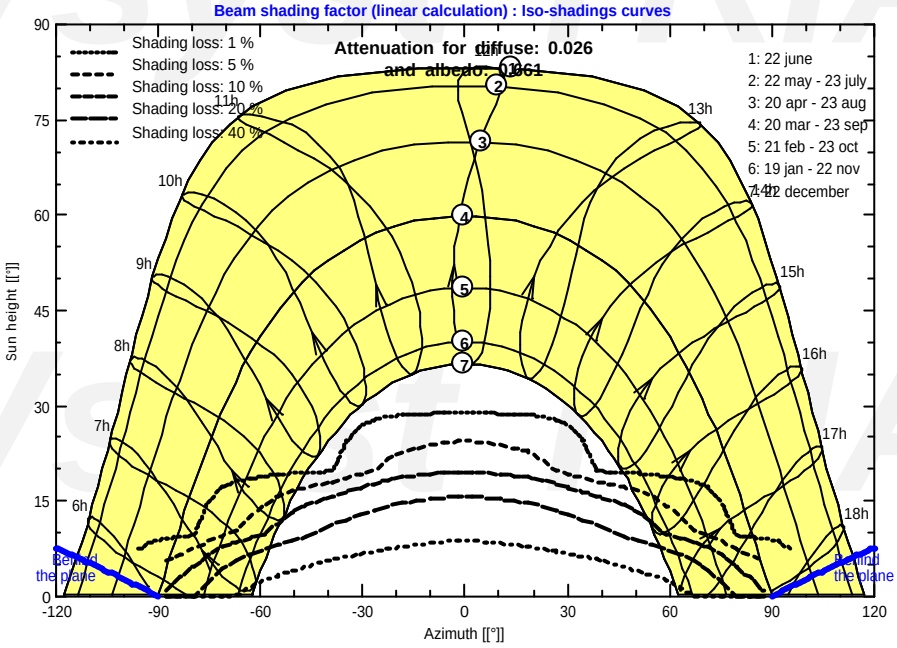
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Ground Mount, Egypt

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



Grid-Connected System: Main results

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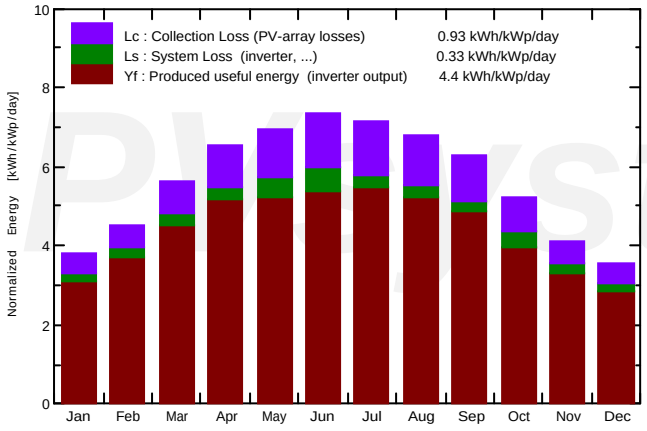
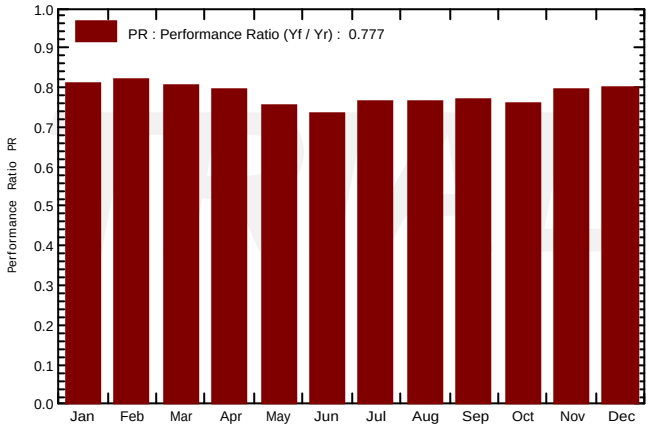
Main simulation results

System Production	**Produced Energy**	**1179 MWh/year**	Specific prod.	1605 kWh/kWp/year
	Performance Ratio PR	77.69 %		

Normalized productions (per installed kWp): Nominal power 734 kWp



Performance Ratio PR



Ground Mount, Egypt

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	94.5	39.36	14.53	117.9	109.7	75.5	70.2	0.811
February	108.4	53.23	15.54	126.5	118.3	81.3	76.1	0.819
March	157.8	70.34	18.66	173.9	163.4	109.4	102.9	0.805
April	187.6	78.80	21.60	195.6	183.9	121.0	114.1	0.794
May	216.4	86.79	25.51	215.7	203.0	130.9	119.5	0.754
June	225.6	79.04	27.94	219.8	207.1	131.9	118.8	0.736
July	225.5	77.92	29.56	221.9	208.0	131.8	124.5	0.764
August	206.4	80.61	29.36	211.2	197.7	125.9	118.9	0.767
September	174.0	64.86	27.36	188.3	176.4	113.4	106.8	0.773
October	140.4	62.04	24.44	161.6	150.9	99.2	90.0	0.758
November	101.4	42.88	19.75	124.2	115.5	77.9	72.7	0.797
December	87.2	39.22	16.23	109.8	101.5	69.7	64.6	0.801
Year	1925.1	775.08	22.58	2066.4	1935.3	1267.8	1179.0	0.777

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

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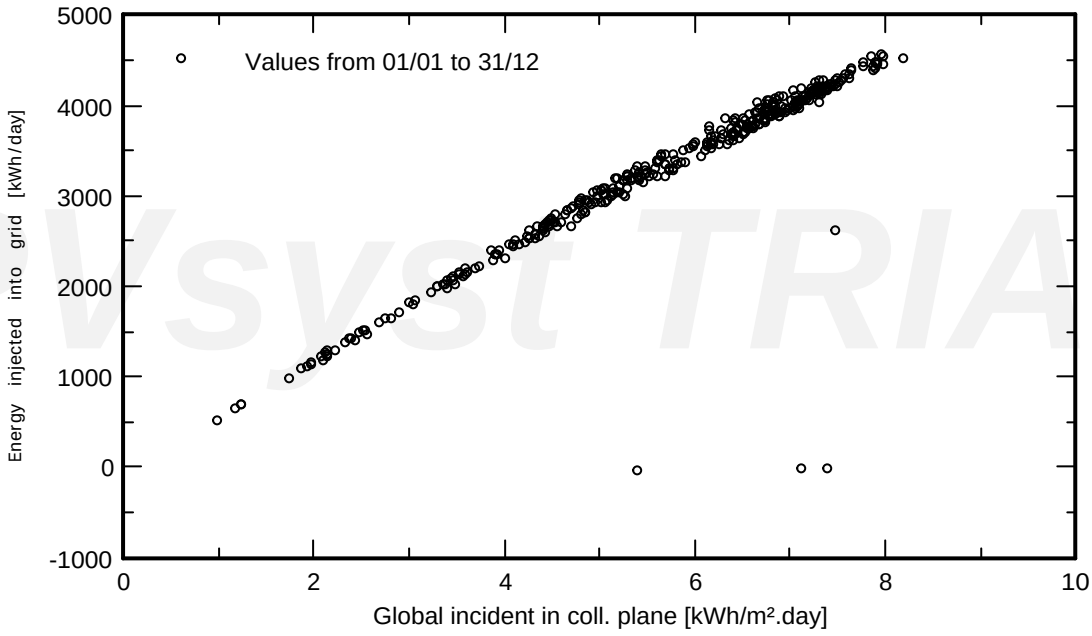
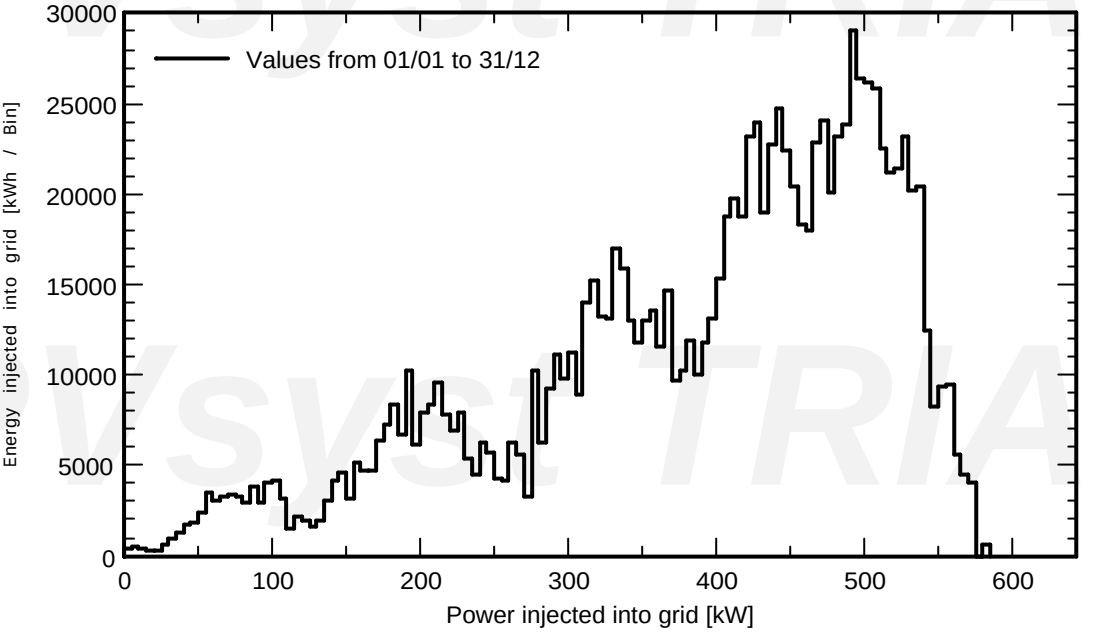
Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

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Loss diagram over the whole year