PVSYST
PHOTOVOLTAIC SOFTWARE

PVsyst - Simulation report

Grid-Connected System

Project: DEMO Commercial installation at California

Variant: LTWP - Solar

No 3D scene defined, no shadings

System power: 77.50 MWp

Loyengalani - Kenya

Author

PVsyst V8.0.6
VC0, Simulation date:
14/02/25 23:49
with V8.0.6

Project summary

Geographical Site
Loyengalani
Kenya

Situation

Latitude	2.76 °N
Longitude	36.72 °E
Altitude	383 m
Time zone	UTC+3

Project settings

Albedo	0.20

Weather data
Loyengalani
NASA-SSE satellite data 1983-2005 - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

Orientation #1

Tracking plane, horizontal N-S axis	
Axis azimuth	0 °
Phi min / max.	-/+ 55 °
Diffuse shading	Automatic
Tracking algorithm	
Astronomic calculation	
Wind stow	
Wind speed threshold	12 m/s
Wind stow position	0 °

Near Shadings
no Shadings

User's needs
Unlimited load (grid)

System information

PV Array		Inverters	
Nb. of modules	250002 units	Nb. of units	212 units
Pnom total	77.50 MWp	Pnom total	74.62 MWac
		Pnom ratio	1.039

Results summary

Produced Energy	197.30 GWh/year	Specific production	2546 kWh/kWp/year	Perf. Ratio PR	85.28 %

Table of contents

PVsyst V8.0.6
VC0, Simulation date:
14/02/25 23:49
with V8.0.6

General parameters

Grid-Connected System — No 3D scene defined, no shadings

Orientation #1

Tracking plane, horizontal N-S axis	
Axis azimuth	0 °
Phi min / max.	-/+ 55 °
Diffuse shading	Automatic
Tracking algorithm	
Astronomic calculation	
Wind stow	
Wind speed threshold	12 m/s
Wind stow position	0 °

Trackers configuration	
No 3D scene defined	

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon
Free Horizon

Near Shadings
no Shadings

User's needs
Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Generic
Model	JKM-310M-60H-BDVP-Bifacial
(Original PVsyst database)	
Unit Nom. Power	310 Wp
Number of PV modules	250002 units
Nominal (STC)	77.50 MWp
Modules	7353 string x 34 In series
At operating cond. (50°C)	
Pmpp	70.53 MWp
U mpp	1019 V
I mpp	69207 A

Inverter

Manufacturer	Generic
Model	SOFAR 350KTX0
(Original PVsyst database)	
Unit Nom. Power	352 kWac
Number of inverters	212 units
Total power	74624 kWac
Operating voltage	500-1500 V
Pnom ratio (DC:AC)	1.04
Power sharing within this inverter	

Total PV power

Nominal (STC)	77501 kWp
Total	250002 modules
Module area	425352 m²
Cell area	372003 m²

Total inverter power

Total power	74624 kWac
Number of inverters	212 units
Pnom ratio	1.04

Array losses

Thermal Loss factor

Module temperature according to irradiance	
Uc (const)	29.0 W/m²K
Uv (wind)	2.0 W/m²K/m/s

DC wiring losses

Global array res.	0.24 mΩ
Loss Fraction	1.5 % at STC

LID - Light Induced Degradation

Loss Fraction	1.5 %

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	0.963	0.892	0.814	0.679	0.438	0.000

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VC0, Simulation date:
14/02/25 23:49
with V8.0.6

AC wiring losses

Inv. output line up to injection point

Inverter voltage	800 Vac tri	
Loss Fraction	0.00 % at STC	
Inverter: SOFAR 350KTX0		
Wire section (212 Inv.)	Copper 212 x 3 x 120	mm²
Average wires length	0	m

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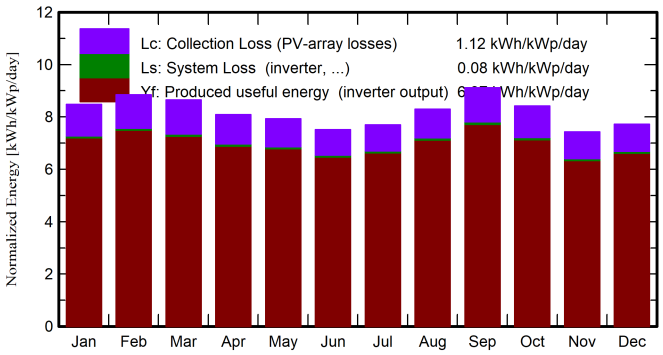
VC0, Simulation date:
14/02/25 23:49
with V8.0.6

Main results

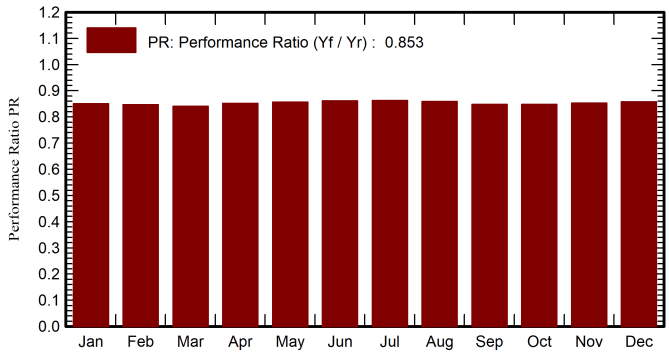
System Production

Produced Energy	197.30 GWh/year	Specific production	2546 kWh/kWp/year
		Perf. Ratio PR	85.28 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray GWh	E_Grid GWh	PR ratio
January	191.6	51.15	26.81	262.7	261.3	17.51	17.32	0.851
February	183.1	49.00	27.76	247.8	246.7	16.45	16.27	0.847
March	201.2	60.76	27.91	268.2	266.8	17.68	17.48	0.841
April	183.0	60.00	27.02	242.8	241.5	16.22	16.03	0.852
May	184.8	56.11	26.93	245.7	244.4	16.50	16.31	0.857
June	171.0	52.50	26.53	225.5	224.2	15.23	15.06	0.861
July	179.8	54.87	26.20	238.5	237.1	16.13	15.95	0.863
August	192.5	56.73	26.49	257.2	256.0	17.31	17.11	0.859
September	201.3	55.20	26.99	273.5	272.4	18.18	17.97	0.847
October	194.1	58.59	26.67	260.9	259.4	17.35	17.16	0.849
November	169.8	56.40	25.51	223.0	221.4	14.92	14.75	0.853
December	179.2	53.01	25.73	239.3	237.7	16.08	15.90	0.857
Year	2231.3	664.32	26.71	2985.1	2968.8	199.55	197.30	0.853

Legends

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

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VC0, Simulation date:
14/02/25 23:49
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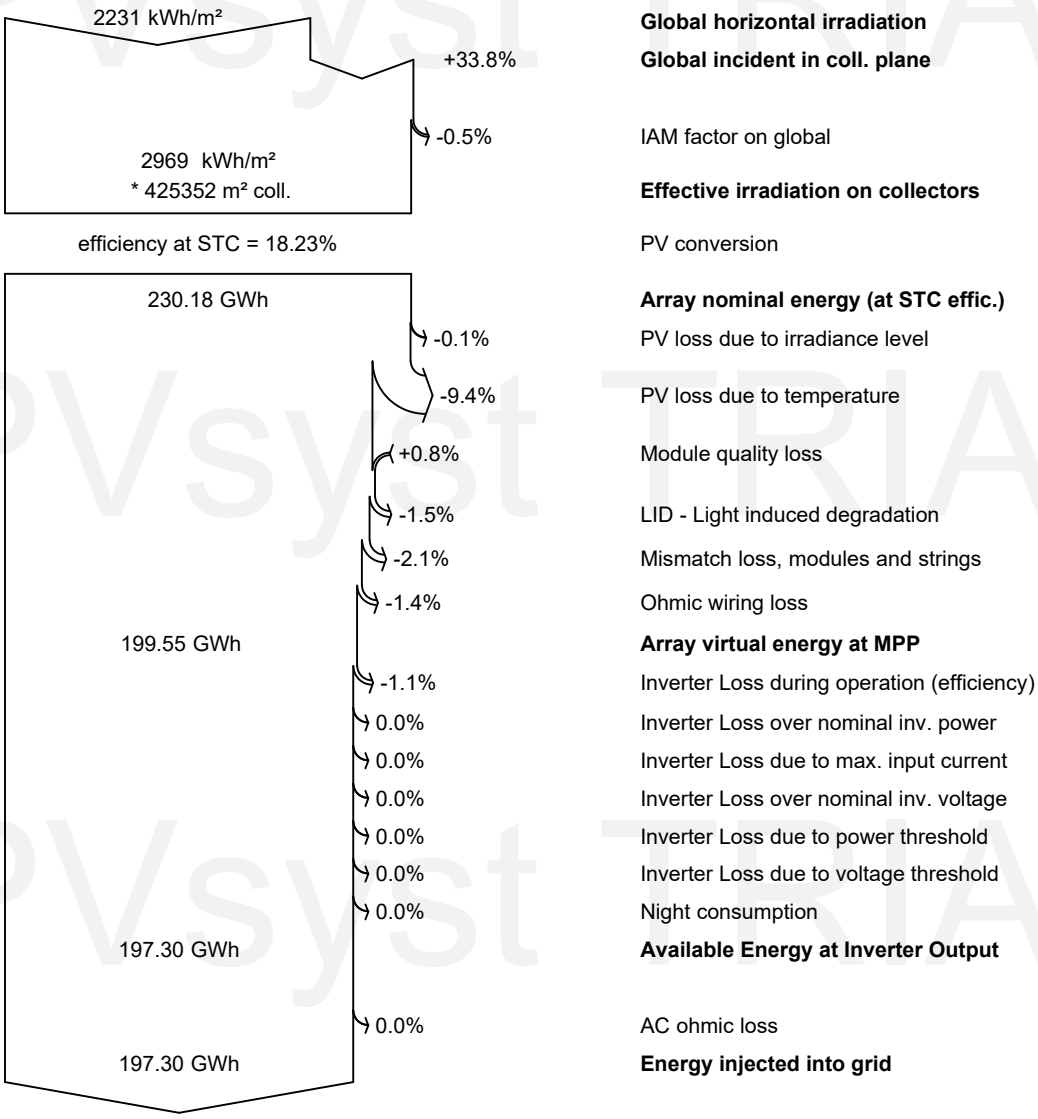
Loss diagram



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VC0, Simulation date:
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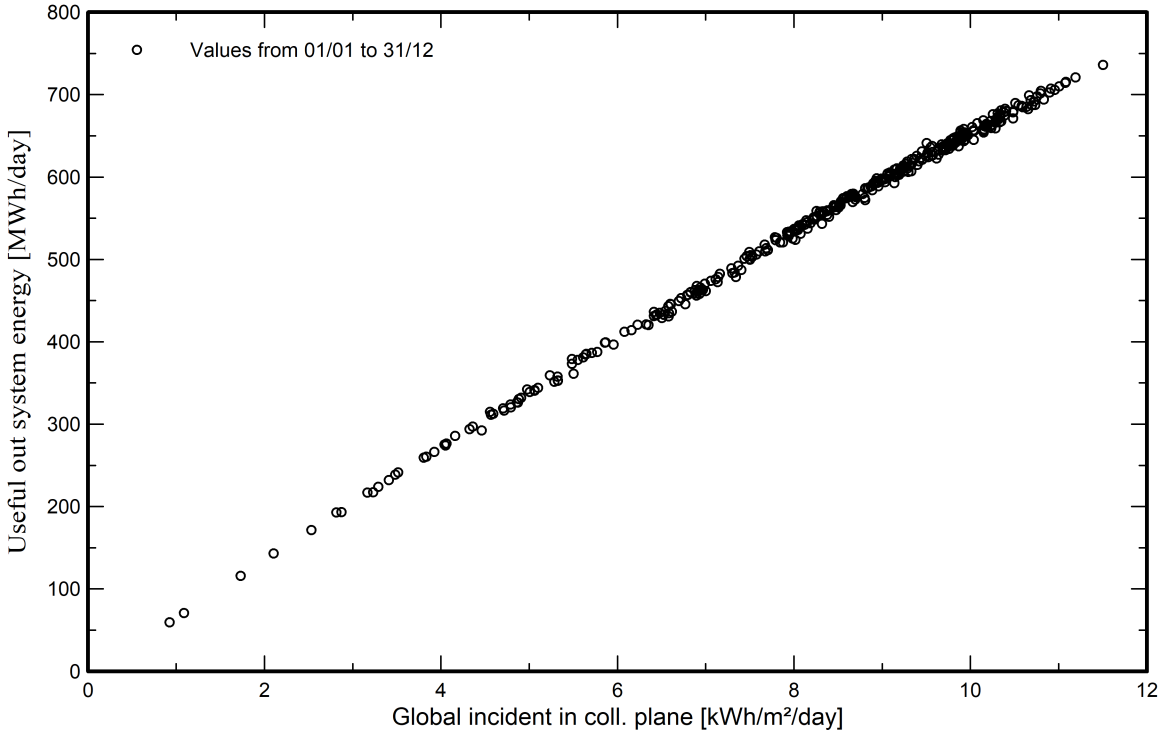
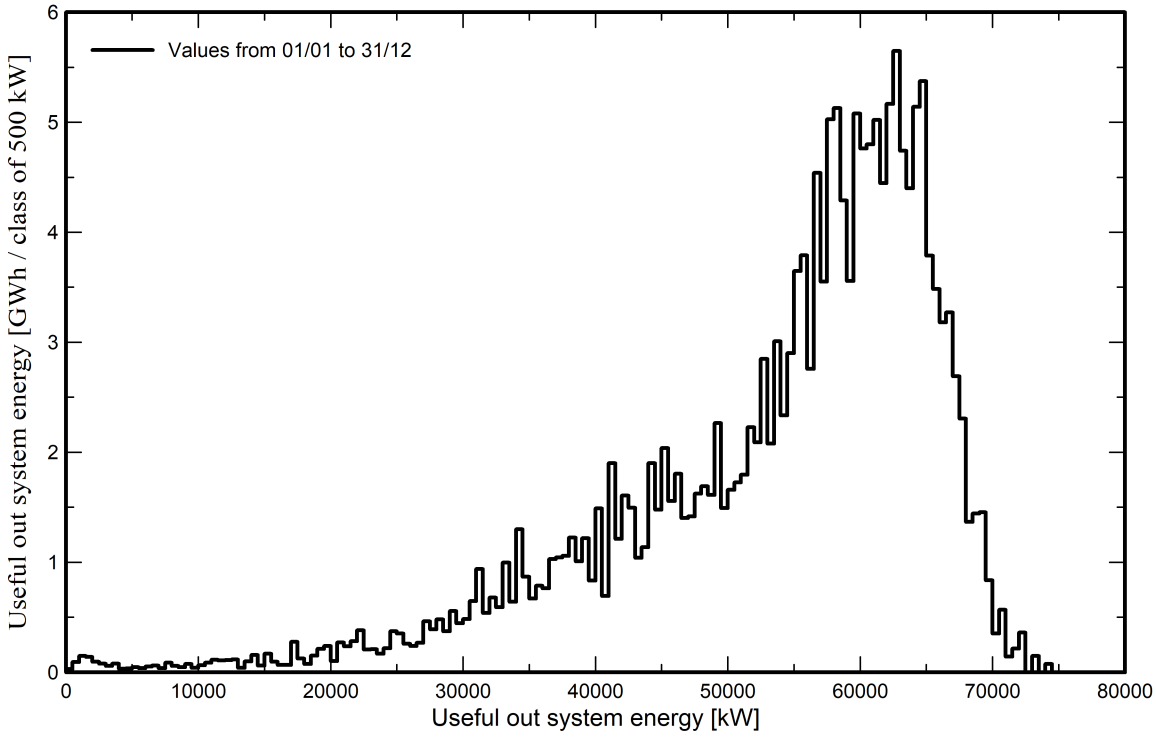
Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



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VC0, Simulation date:
14/02/25 23:49
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Cost of the system

Installation costs

Item	Quantity units	Cost EUR	Total EUR
		Total Depreciable asset	0.00 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	108231 MWh/year
Cost of produced energy (LCOE)	0.0000 EUR/kWh

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VC0, Simulation date:
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CO_2 Emission Balance

Total: 1557333.1 tCO_2

Generated emissions

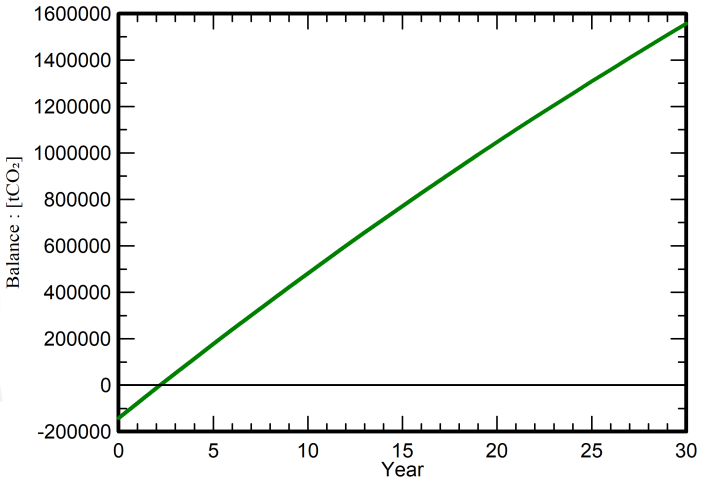
Total: 142578.07 tCO_2

Source: Detailed calculation from table below

Replaced Emissions

Total: 1959178.2 tCO_2
System production: 197298.91 MWh/yr
Grid Lifecycle Emissions: 331 gCO_2/kWh
Source: IEA List
Country: Kenya
Lifetime: 30 years
Annual degradation: 1.0 %

Saved CO_2 Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[$kgCO_2$]
Modules	1989 kgCO2/kWp	69206 kWp	137647607
Supports	2.21 kgCO2/kg	2232440 kg	4928714
Inverters	219 kgCO2/	8.00	1750