

PVsyst - Simulation report

Grid-Connected System

Project: Case 01 Manufacturing Factory - GridDieselPV Cost Reduction

Variant: VC0 - 2874 kWp - Max Roof - Zero Export

No 3D scene defined, no shadings

System power: 2874 kWp

Yan Kusa - Nigeria



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VC0, Simulation date:

15/08/26 19:56

with V8.0.6

Project summary

Geographical Site

Yan Kusa

Nigeria

Situation

Latitude

11.91 °N

Longitude

8.48 °E

Altitude

449 m

Time zone

UTC+1

Project settings

Albedo

0.20

Weather data

Yan Kusa

Meteonorm 8.2 (2010-2021), Sat=100% - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

Orientation #1

Fixed plane

Tilt/Azimuth

15.8 / 0 °

Near Shadings

no Shadings

User's needs

Ext. defined as file

Case01_PVsyst_Load_8760.csv

No grid reinjection

System information

PV Array

Nb. of modules

5423 units

Pnom total

2874 kWp

Inverters

Nb. of units

22 units

Pnom total

2200 kWac

Pnom ratio

1.306

Results summary

Produced Energy

4333.2 MWh/year

Specific production

1508 kWh/kWp/year

Perf. Ratio PR

67.45 %

Used Energy

9014.4 MWh/year

Solar Fraction SF

48.07 %

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General parameters

Grid-Connected System

No 3D scene defined, no shadings

Orientation #1

Fixed plane

Tilt/Azimuth 15.8 / 0 °

Sheds configuration

No 3D scene defined

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Free Horizon

Near Shadings

no Shadings

User's needs

Ext. defined as file

Case01_PVsyst_Load_8760.csv

No grid reinjection

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year	
777600	691200	748800	748800	748800	748800	777600	748800	748800	777600	720000	777600	9014401	kWh

PV Array Characteristics

PV module

Manufacturer

Generic

Model

JKM-530M-72HL4-TV

(Original PVsyst database)

Unit Nom. Power

530 Wp

Number of PV modules

5423 units

Nominal (STC)

2874 kWp

Modules

319 string x 17 In series

At operating cond. (50°C)

Pmpp

2622 kWp

U mpp

631 V

I mpp

4157 A

Total PV power

Nominal (STC)

2874 kWp

Total

5423 modules

Module area

13984 m²

Inverter

Manufacturer

Generic

Model

Sunny Highpower SHP100-21-PEAK3

(Original PVsyst database)

Unit Nom. Power

100 kWac

Number of inverters

22 units

Total power

2200 kWac

Operating voltage

570-1000 V

Pnom ratio (DC:AC)

1.31

Total inverter power

Total power

2200 kWac

Number of inverters

22 units

Pnom ratio

1.31

Array losses

Thermal Loss factor

Module temperature according to irradiance

Uc (const)

20.0 W/m²K

Uv (wind)

0.0 W/m²K/m/s

DC wiring losses

Global array res.

2.5 mΩ

Loss Fraction

1.5 % at STC

Module Quality Loss

Loss Fraction

-0.8 %

Module mismatch losses

Loss Fraction

2.0 % at MPP

Strings Mismatch loss

Loss Fraction

0.2 %

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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Main results

System Production

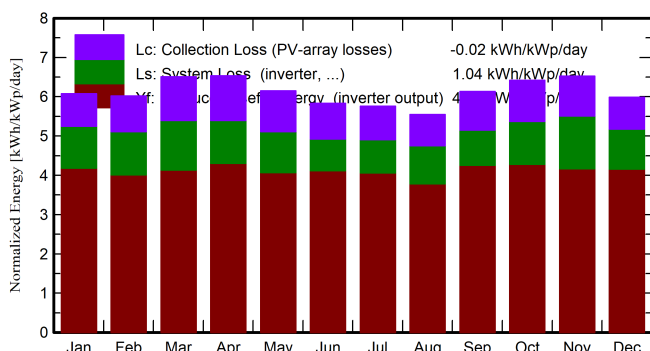
Produced Energy 4333.2 MWh/year
Used Energy 9014.4 MWh/year

Specific production 1508 kWh/kWp/year
Perf. Ratio PR 67.45 %
Solar Fraction SF 48.07 %

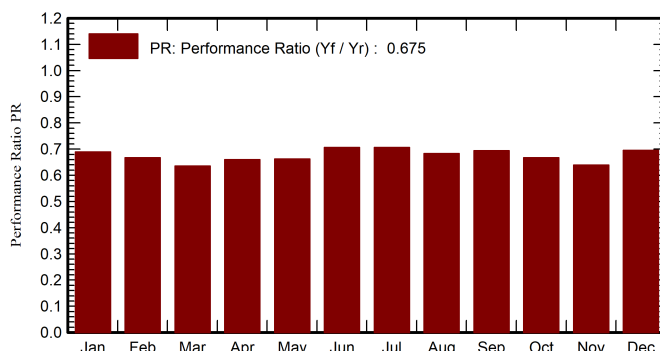
Economic evaluation

Investment		Yearly cost		LCOE	
Global	1,868,223.50 USD	Annuities	0.00 USD/yr	Energy cost	0.06 USD/kWh
Specific	0.65 USD/Wp	Run. costs	28,023.35 USD/yr		
		Payback period	1.8 years		

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 MWh	E_User MWh	E_Solar MWh	EUnused MWh	EFrGrid MWh
January	164.4	68.68	20.93	188.4	185.0	467.9	777.6	372.9	87.7	404.7
February	156.0	80.40	24.24	168.5	165.6	411.5	691.2	323.2	81.9	368.0
March	196.0	95.66	28.51	201.8	198.4	481.5	748.8	368.5	105.5	380.3
April	200.6	91.81	31.08	196.0	192.4	465.4	748.8	371.5	86.8	377.3
May	204.5	88.38	31.55	190.7	186.5	455.5	748.8	362.8	85.8	386.0
June	191.3	85.27	28.80	174.9	170.8	425.2	748.8	355.1	63.7	393.7
July	193.7	85.00	26.95	178.4	174.1	437.6	777.6	362.1	68.9	415.5
August	179.3	89.10	25.89	171.9	168.0	423.7	748.8	337.4	79.8	411.4
September	182.8	74.23	26.50	184.1	180.5	444.7	748.8	367.3	70.5	381.5
October	185.7	77.49	27.63	199.0	195.6	478.9	777.6	381.7	89.7	395.9
November	172.0	58.51	24.54	195.7	192.8	475.3	720.0	359.4	108.4	360.6
December	159.6	64.35	21.26	185.6	182.4	461.8	777.6	371.2	83.5	406.4
Year	2185.9	958.89	26.49	2235.1	2192.2	5428.9	9014.4	4333.2	1012.0	4681.2

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_User	Energy supplied to the user
T_Amb	Ambient Temperature	E_Solar	Energy from the sun
GlobInc	Global incident in coll. plane	EUnused	Unused energy (no grid injection)
GlobEff	Effective Global, corr. for IAM and shadings	EFrGrid	Energy from the grid



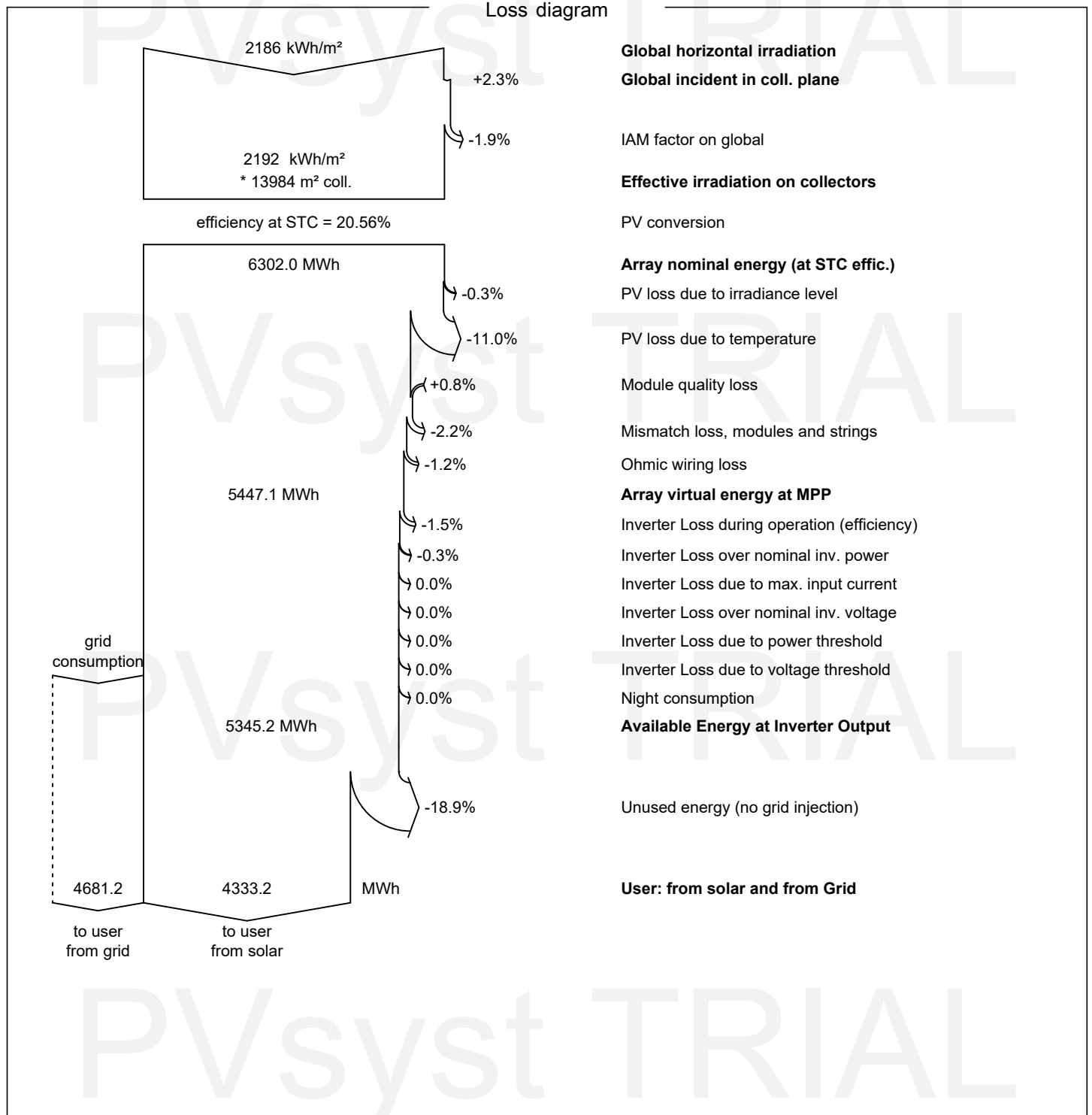
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Loss diagram





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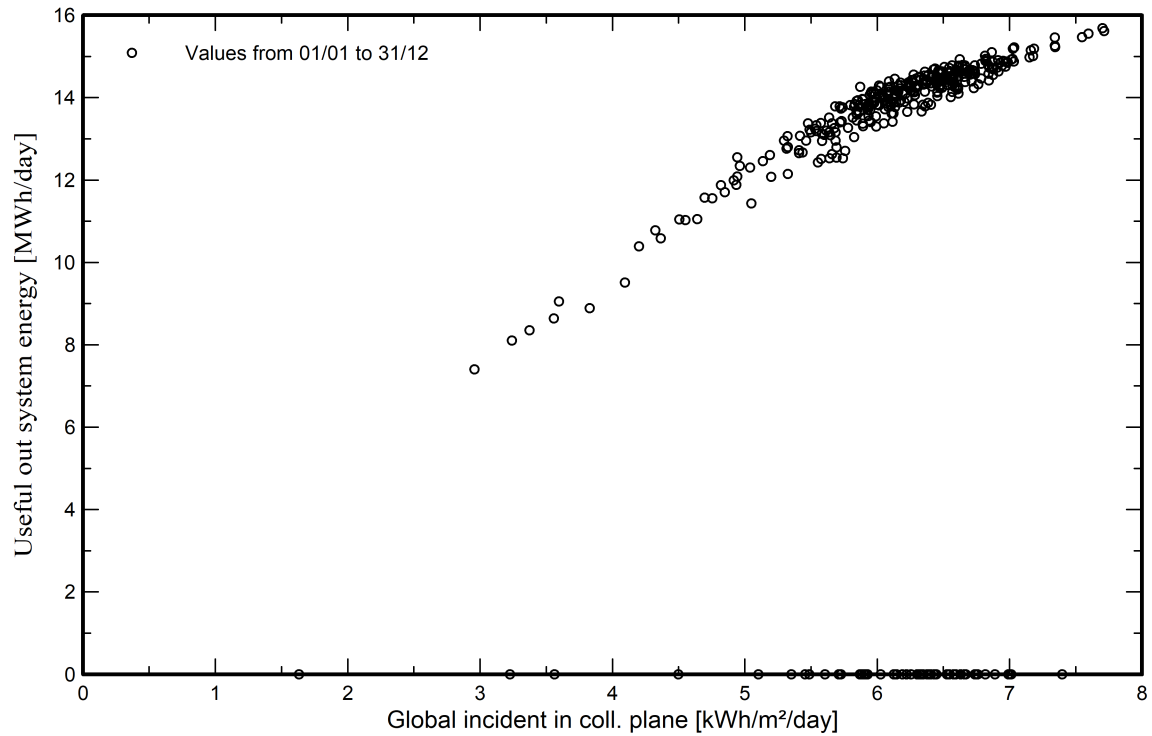
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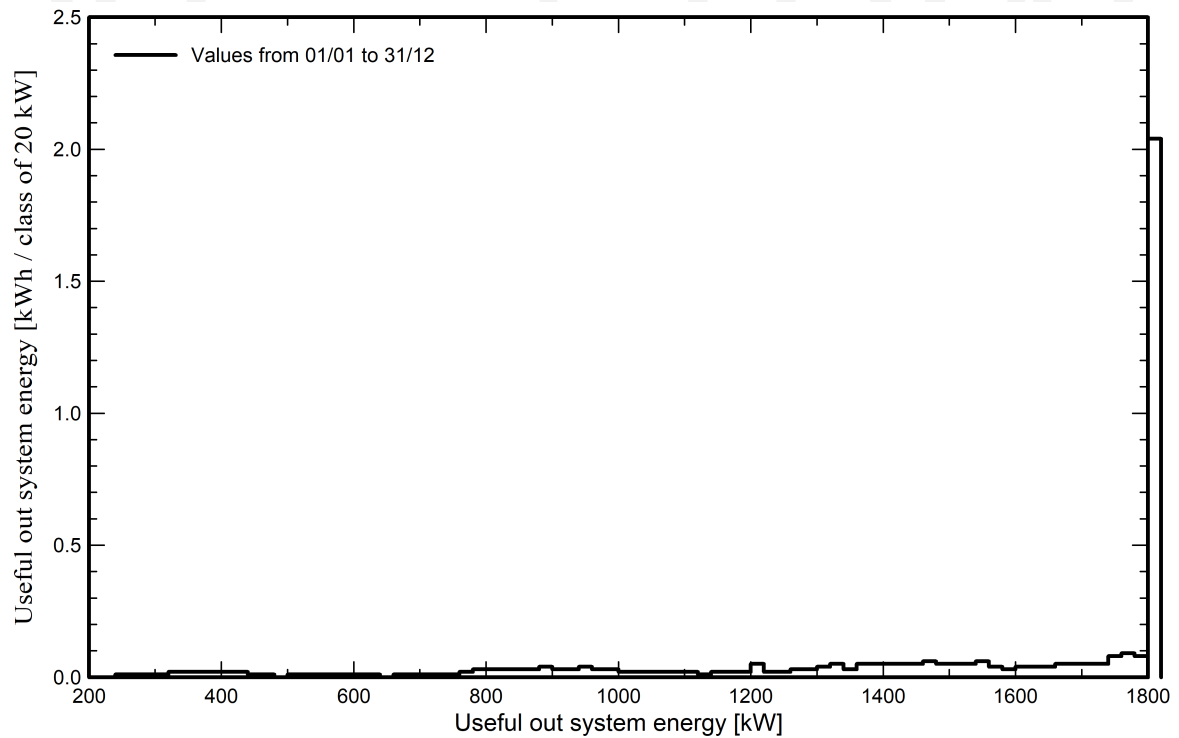
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Predef. graphs

Daily Input/Output diagram



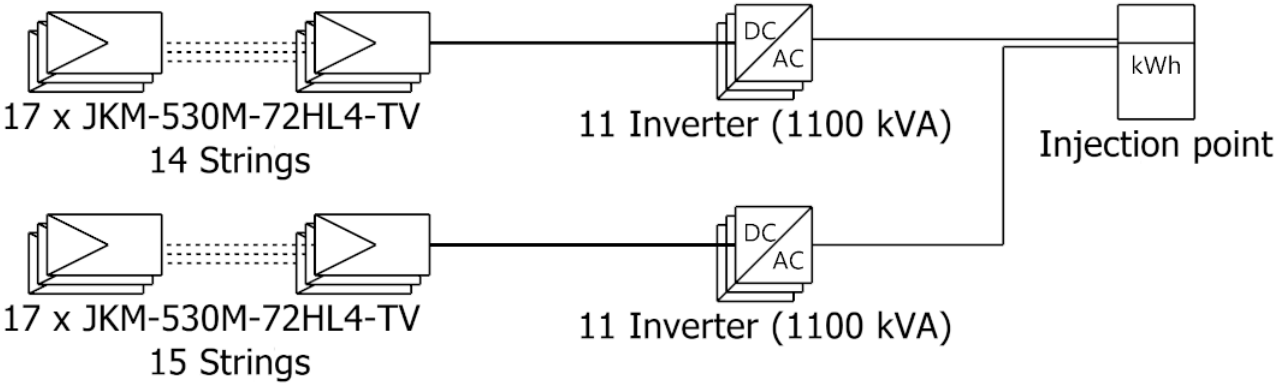
System Output Power Distribution





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Single-line diagram



PV module	JKM-530M-72HL4-TV
Inverter	Sunny Highpower SHP100-21-PEAK3
String	17 x JKM-530M-72HL4-TV

Case 01 Manufacturing Factory
- GridDieselPV Cost Reduction

VC0 : VC0 - 2874 kWp - Max Roof - Ze
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13/09/26



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Cost of the system

Installation costs

Item	Quantity units	Cost USD	Total USD
PV modules JKM-530M-72HL4-TV	5423	344.50	1,868,223.50
		Total	1,868,223.50
		Depreciable asset	1,868,223.50

Operating costs

Item	Total USD/year
Land rent	28,023.35
Total (OPEX)	28,023.35

System summary

Total installation cost	1,868,223.50 USD
Operating costs	28,023.35 USD/year
Produced Energy	4333 MWh/year
Cost of produced energy (LCOE)	0.0571 USD/kWh



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Financial analysis

Simulation period

Project lifetime 20 years Start year 2027

Income variation over time

Inflation 0.00 %/year

Production variation (aging) 0.00 %/year

Discount rate 10.00 %/year

Income dependent expenses

Income tax rate 0.00 %/year

Other income tax 0.00 %/year

Dividends 0.00 %/year

Depreciable assets

Asset	Depreciation method	Depreciation period (years)	Salvage value (USD)	Depreciable (USD)
PV modules JKM-530M-72HL4-TV	Straight-line	20	0.00	1,868,223.50
		Total	0.00	1,868,223.50

Financing

Own funds 1,868,223.50 USD

Electricity sale

Feed-in tariff 0.00100 USD/kWh

Duration of tariff warranty 20 years

Annual connection tax 0.00 USD/kWh

Annual tariff variation 0.0 %/year

Feed-in tariff decrease after warranty 0.00 %

Self-consumption

Consumption tariff 0.28340 USD/kWh

Tariff evolution 0.0 %/year

Return on investment

Payback period 1.8 years

Net present value (NPV) 8,348,090.76 USD

Internal rate of return (IRR) 64.23 %

Return on investment (ROI) 446.8 %



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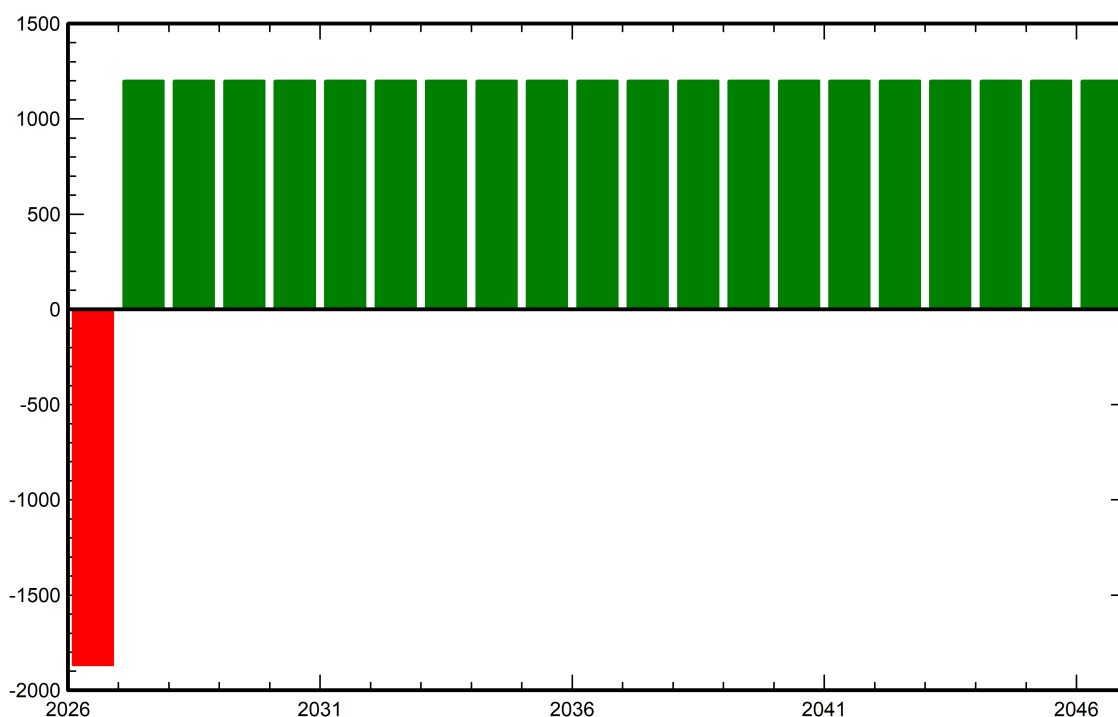
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Financial analysis

Detailed economic results (USD)

Year	Electricity sale	Own funds	Run. costs	Deprec. allow.	Taxable income	Taxes	After-tax profit	Self-cons. saving	Cumul. profit	% amorti.
0	0	1,868,224	0	0	0	0	0	0	-1,868,224	0.0%
1	0	0	28,023	93,411	0	0	-28,023	1,228,028	-777,310	58.4%
2	0	0	28,023	93,411	0	0	-28,023	1,228,028	214,429	111.5%
3	0	0	28,023	93,411	0	0	-28,023	1,228,028	1,116,010	159.7%
4	0	0	28,023	93,411	0	0	-28,023	1,228,028	1,935,629	203.6%
5	0	0	28,023	93,411	0	0	-28,023	1,228,028	2,680,737	243.5%
6	0	0	28,023	93,411	0	0	-28,023	1,228,028	3,358,109	279.7%
7	0	0	28,023	93,411	0	0	-28,023	1,228,028	3,973,901	312.7%
8	0	0	28,023	93,411	0	0	-28,023	1,228,028	4,533,712	342.7%
9	0	0	28,023	93,411	0	0	-28,023	1,228,028	5,042,631	369.9%
10	0	0	28,023	93,411	0	0	-28,023	1,228,028	5,505,284	394.7%
11	0	0	28,023	93,411	0	0	-28,023	1,228,028	5,925,879	417.2%
12	0	0	28,023	93,411	0	0	-28,023	1,228,028	6,308,237	437.7%
13	0	0	28,023	93,411	0	0	-28,023	1,228,028	6,655,835	456.3%
14	0	0	28,023	93,411	0	0	-28,023	1,228,028	6,971,834	473.2%
15	0	0	28,023	93,411	0	0	-28,023	1,228,028	7,259,106	488.6%
16	0	0	28,023	93,411	0	0	-28,023	1,228,028	7,520,262	502.5%
17	0	0	28,023	93,411	0	0	-28,023	1,228,028	7,757,676	515.2%
18	0	0	28,023	93,411	0	0	-28,023	1,228,028	7,973,507	526.8%
19	0	0	28,023	93,411	0	0	-28,023	1,228,028	8,169,718	537.3%
20	0	0	28,023	93,411	0	0	-28,023	1,228,028	8,348,091	546.8%
Total	0	1,868,224	560,467	1,868,224	0	0	-560,467	24,560,556	8,348,091	546.8%

Yearly net profit (kUSD)





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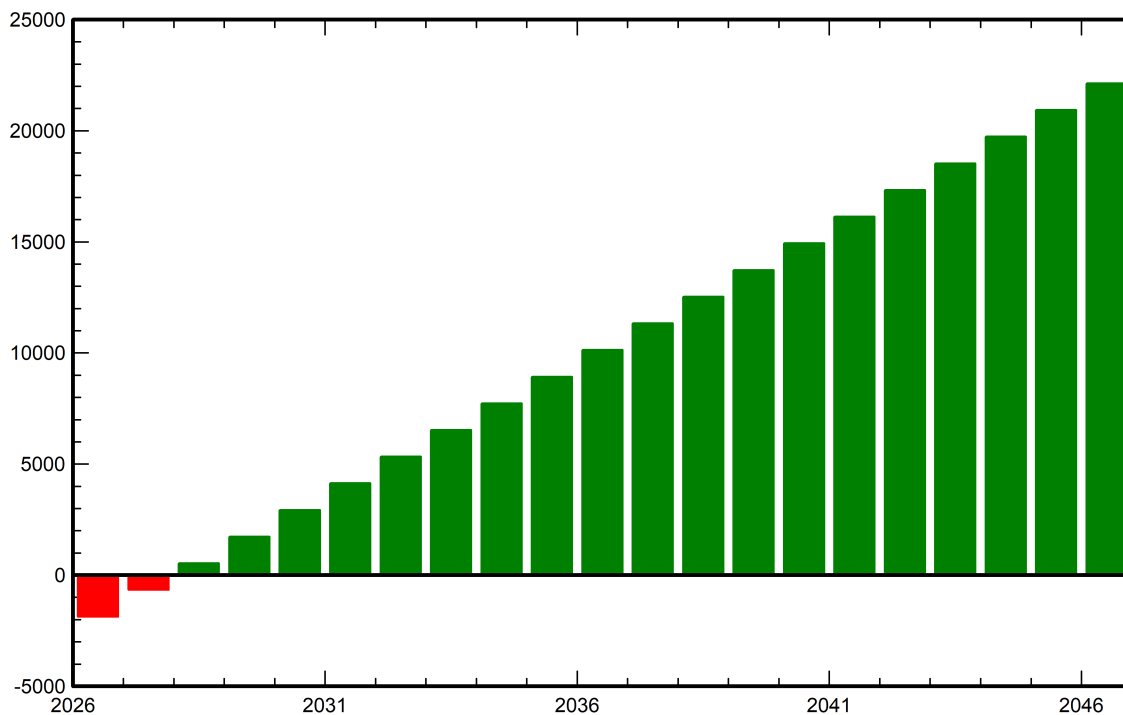
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Financial analysis
Cumulative cashflow (kUSD)





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CO₂ Emission Balance

Total: 50863.6 tCO₂

Generated emissions

Total: 5073.94 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 64469.1 tCO₂

System production: 5345.69 MWh/yr

Grid Lifecycle Emissions: 402 gCO₂/kWh

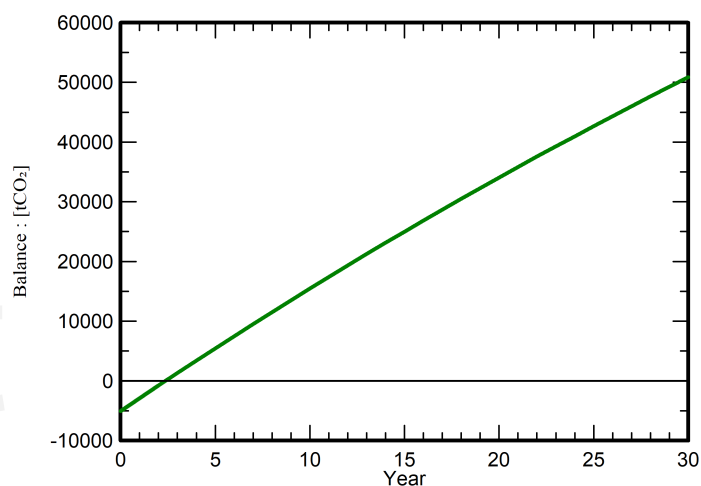
Source: IEA List

Country: Nigeria

Lifetime: 30 years

Annual degradation: 1.0 %

Saved CO₂ Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[kgCO ₂]
Modules	1713 kgCO ₂ /kWp	2874 kWp	4922683
Supports	2.68 kgCO ₂ /kg	54230 kg	145409
Inverters	266 kgCO ₂ /	22.0	5844