Version 7.3.4

PVsyst - Simulation report

Grid-Connected System

Project: Sim00

Variant: BIFACIAL_Row4

Unlimited Trackers with backtracking

System power: 53.3 kWp

NREL BEST Field - United States

Author

National renewable energy laboratory (United states)

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Project summary

Geographical Site
NREL BEST Field
United States

Situation

Latitude	39.74 °N
Longitude	-105.17 °W
Altitude	1765 m
Time zone	UTC-7

Meteo data
DENVER/CENTENNIAL [GOLDEN - NREL]
NREL BEST Field - TMY

Monthly albedo values

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Albedo	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20

System summary

Grid-Connected System
Unlimited Trackers with backtracking

PV Field Orientation
Orientation
Tracking horizontal axis

Tracking algorithm
Astronomic calculation
Backtracking activated

Near Shadings
No Shadings

System information

PV Array

Nb. of modules	144 units
Pnom total	53.3 kWp

Inverters

Nb. of units	3 units
Pnom total	72.0 kWac
Pnom ratio	0.740

User's needs
Unlimited load (grid)

Results summary

Produced Energy	108860 kWh/year	Specific production	2043 kWh/kWp/year	Perf. Ratio PR	86.48 %

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General parameters

Grid-Connected System — **Unlimited Trackers with backtracking**

PV Field Orientation

Orientation	Tracking algorithm	Backtracking array		
Tracking horizontal axis	Astronomic calculation	Nb. of trackers	10	units
	Backtracking activated	Unlimited trackers		
		Sizes		
		Tracker Spacing	5.70	m
		Collector width	2.00	m
		Ground Cov. Ratio (GCR)	35.1	%
		Left inactive band	0.02	m
		Right inactive band	0.02	m
		Phi min / max.	-/+ 50.0	°
		Backtracking strategy		
		Phi limits for BT	-/+ 68.9	°
		Backtracking pitch	5.70	m
		Backtracking width	2.00	m

Models used

Transposition	Perez
Diffuse	Imported
Circumsolar	with diffuse

Horizon
Free Horizon

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

Bifacial system
Model: 2D Calculation unlimited trackers

Bifacial model geometry			Bifacial model definitions	
Tracker Spacing	5.70	m	Ground albedo	0.20
Tracker width	2.04	m	Bifaciality factor	75 %
GCR	35.8	%	Rear shading factor	5.0 %
Axis height above ground	1.50	m	Rear mismatch loss	10.0 %
			Shed transparent fraction	0.0 %

PV Array Characteristics

PV module

Manufacturer	Longi Solar
Model	LR6-72 BP 370 M Bifacial
(Original PVsyst database)	
Unit Nom. Power	370 Wp
Number of PV modules	144 units
Nominal (STC)	53.3 kWp
Modules	9 Strings x 16 In series
At operating cond. (50°C)	
Pmpp	48.4 kWp
U mpp	568 V
I mpp	85 A

Inverter

Manufacturer	Fronius USA
Model	Symo Advanced 24.0-3 480
(Original PVsyst database)	
Unit Nom. Power	24.0 kWac
Number of inverters	3 * MPPT 0.57 3 units
Total power	72.0 kWac
Operating voltage	200-800 V
Pnom ratio (DC:AC)	0.74

Total PV power

Nominal (STC)	53 kWp
Total	144 modules
Module area	284 m²
Cell area	254 m²

Total inverter power

Total power	72 kWac
Number of inverters	3 units
Pnom ratio	0.74

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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. 112 mΩ
Loss Fraction 1.5 % at STC

LID - Light Induced Degradation
Loss Fraction 1.5 %

Module Quality Loss
Loss Fraction -0.5 %

Module mismatch losses
Loss Fraction 2.0 % at MPP

Strings Mismatch loss
Loss Fraction 0.2 %

IAM loss factor
Incidence effect (IAM): User defined profile

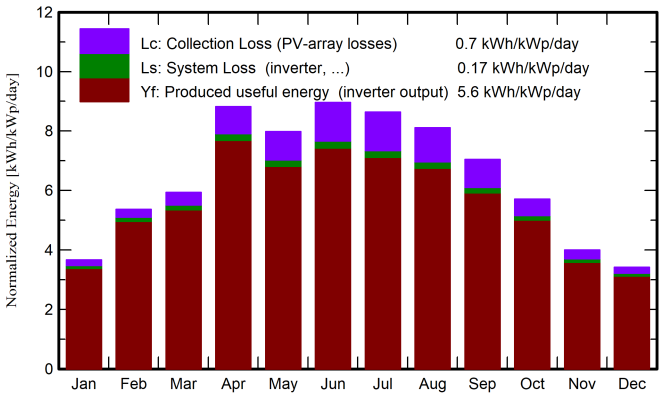
0°	25°	45°	60°	65°	70°	75°	80°	90°
1.000	1.000	0.995	0.962	0.936	0.903	0.851	0.754	0.000

Main results

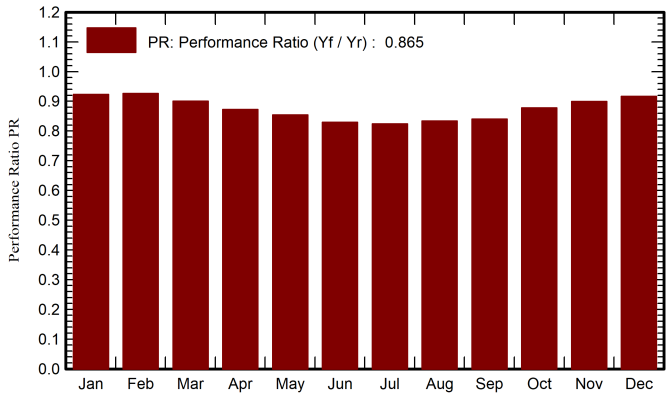
System Production

Produced Energy	108860 kWh/year	Specific production	2043 kWh/kWp/year
		Perf. Ratio PR	86.48 %

Normalized productions (per installed kWp)



Performance Ratio PR



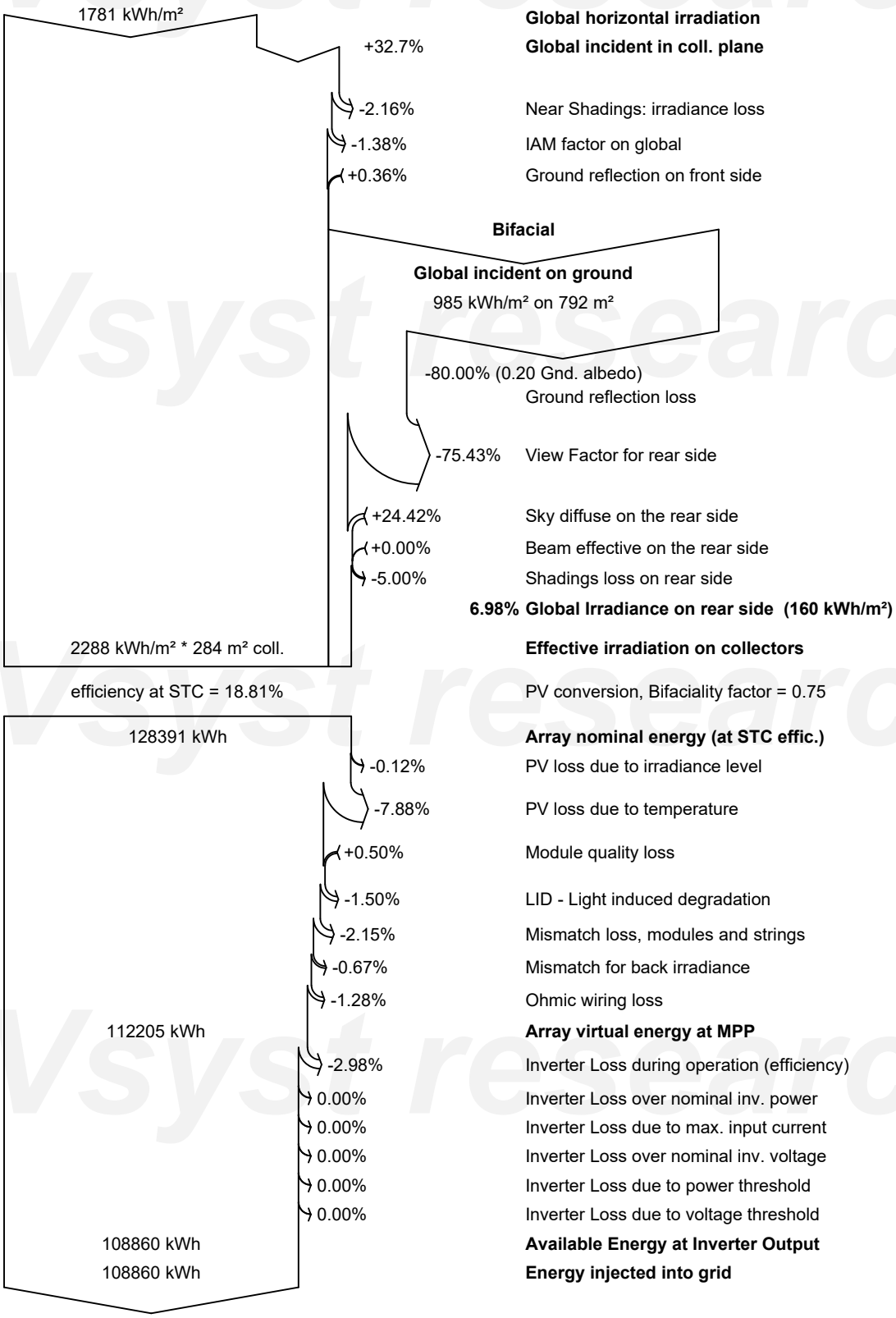
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	81.2	28.03	1.69	113.6	108.5	5760	5589	0.923
February	108.6	32.46	-0.42	150.1	145.0	7620	7409	0.926
March	142.7	55.33	5.08	184.2	178.0	9104	8840	0.901
April	197.1	56.45	9.87	264.6	257.7	12659	12296	0.872
May	195.2	72.55	13.83	247.6	240.1	11614	11264	0.854
June	209.8	67.86	21.86	269.0	261.4	12263	11887	0.829
July	211.3	68.73	24.14	267.7	260.2	12127	11754	0.824
August	194.5	68.72	23.50	251.5	243.9	11516	11164	0.833
September	155.8	43.00	20.31	211.5	205.6	9759	9465	0.840
October	126.1	30.14	12.96	177.1	172.0	8531	8281	0.878
November	84.5	25.42	9.39	119.9	115.0	5919	5741	0.899
December	74.1	23.40	5.14	105.9	100.5	5331	5169	0.916
Year	1781.0	572.09	12.35	2362.6	2287.9	112205	108860	0.865

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



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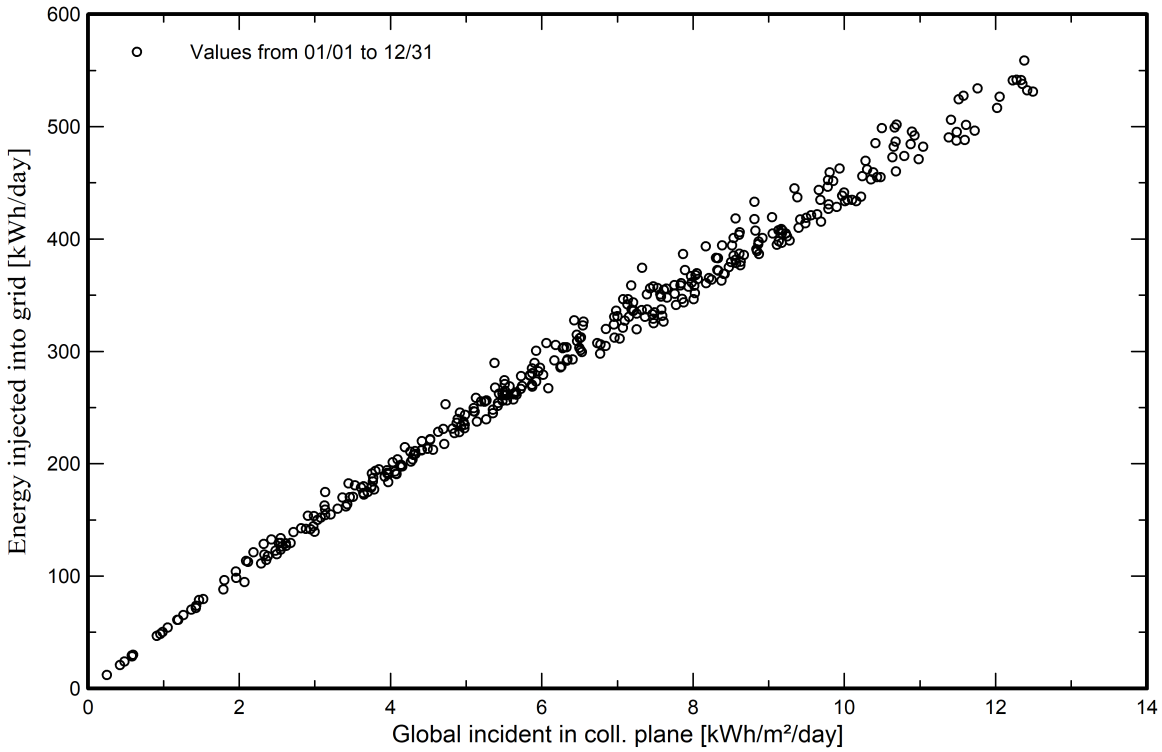
Predef. graphs

Daily Input/Output diagram



System Output Power Distribution