PVsyst - Simulation report

Grid-Connected System

Project: Saha Farm

Variant: 06

No 3D scene defined, no shadings

System power: 200 kWp

Ban Nong Bua Thong - Thailand

Author

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Project summary

Geographical Site
Ban Nong Bua Thong
Thailand

Situation
Latitude	15.53 °N
Longitude	101.13 °E
Altitude	58 m
Time zone	UTC+7

Project settings
Albedo	0.20

Weather data
Ban Nong Bua Thong
Meteonorm 8.1 (1996-2015), Sat=100% - Synthetic

System summary

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

PV Field Orientation
Fixed planes	2 orientations
Tilts/azimuths	20 / 20 °
	20 / -160 °

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

System information
PV Array		**Inverters**	
Nb. of modules	288 units	Nb. of units	3 units
Pnom total	200 kWp	Pnom total	180 kWac
		Pnom ratio	1.112

Results summary

Produced Energy	249524 kWh/year	Specific production	1247 kWh/kWp/year	Perf. Ratio PR	74.98 %

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General parameters

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

PV Field Orientation

Orientation		**Sheds configuration**	**Models used**	
Fixed planes	2 orientations	No 3D scene defined	Transposition	Perez
Tilts/azimuths	20 / 20 °		Diffuse	Perez, Meteonorm
	20 / -160 °		Circumsolar	separate

Horizon	**Near Shadings**	**User's needs**
Free Horizon	No Shadings	Unlimited load (grid)

PV Array Characteristics

PV module		**Inverter**	
Manufacturer	Generic	Manufacturer	Generic
Model	CS7N-695TB-AG 1500V	Model	SUN2000-60KTL-M0_400Vac
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	695 Wp	Unit Nom. Power	60.0 kWac
Number of PV modules	288 units	Number of inverters	3 units
Nominal (STC)	200 kWp	Total power	180 kWac
Modules	16 string x 18 In series	Operating voltage	200-1000 V
At operating cond. (50°C)		Max. power (=>30°C)	66.0 kWac
Pmpp	186 kWp	Pnom ratio (DC:AC)	1.11
U mpp	658 V	Power sharing within this inverter	
I mpp	282 A		

Total PV power		**Total inverter power**	
Nominal (STC)	200 kWp	Total power	180 kWac
Total	288 modules	Max. power	198 kWac
Module area	895 m²	Number of inverters	3 units
		Pnom ratio	1.11

Array losses

Array Soiling Losses		**Thermal Loss factor**		**DC wiring losses**	
Loss Fraction	7.6 %	Module temperature according to irradiance		Global array res.	38 mΩ
		Uc (const)	20.0 W/m²K	Loss Fraction	1.5 % at STC
		Uv (wind)	0.0 W/m²K/m/s		

LID - Light Induced Degradation		**Module Quality Loss**		**Module mismatch losses**	
Loss Fraction	3.0 %	Loss Fraction	2.0 %	Loss Fraction	2.0 % at MPP

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	0.962	0.892	0.816	0.681	0.440	0.000

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PVsyst TRIAL

Main results

System Production

Produced Energy	249524 kWh/year	Specific production	1247 kWh/kWp/year
		Perf. Ratio PR	74.98 %

Normalized productions (per installed kWp)

Lc: Collection Loss (PV-array losses) 1.09 kWh/kWp/day
Ls: System Loss (inverter, ...) 0.05 kWh/kWp/day
Yf: Produced useful energy (inverter output) 3.42 kWh/kWp/day

Performance Ratio PR

PR: Performance Ratio (Yf / Yr) : 0.750
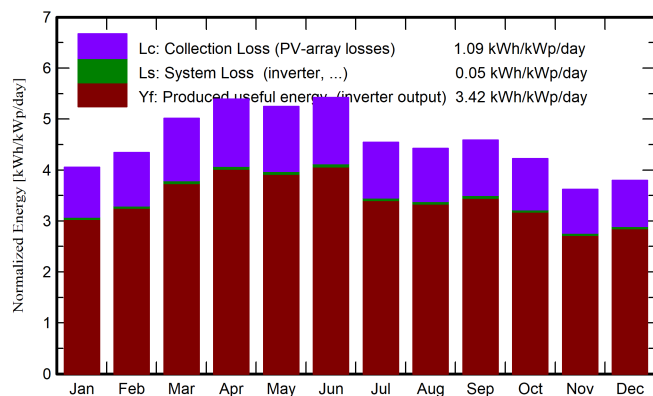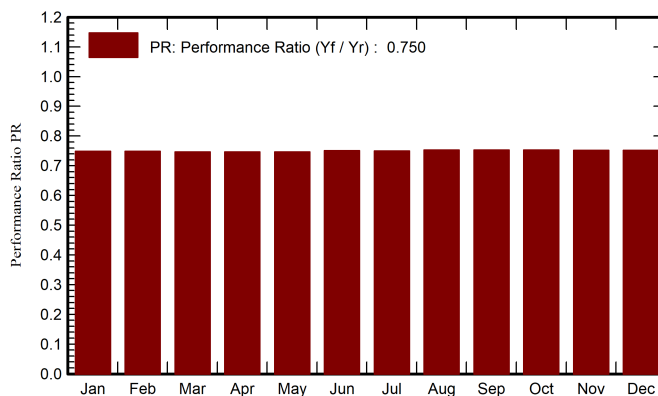
Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m²	kWh/m²	°C	kWh/m²	kWh/m²	kWh	kWh	ratio
January	130.2	60.14	25.50	125.7	112.1	19114	18830	0.748
February	126.1	71.13	27.66	121.6	109.2	18509	18237	0.749
March	161.3	91.31	29.68	155.4	140.0	23556	23218	0.747
April	167.8	90.79	30.16	161.7	146.1	24498	24143	0.746
May	168.9	85.21	29.72	162.7	146.8	24690	24331	0.747
June	168.7	82.29	28.90	162.6	146.8	24795	24432	0.751
July	146.2	76.11	28.80	140.8	126.9	21443	21121	0.749
August	142.6	85.23	28.37	137.2	123.7	21009	20696	0.753
September	143.0	74.73	27.66	137.6	123.8	21049	20736	0.753
October	135.9	80.26	28.09	130.9	117.6	20018	19719	0.753
November	112.9	64.34	26.54	108.7	97.2	16609	16355	0.752
December	122.1	61.77	25.50	117.7	105.0	17974	17706	0.752
Year	1726.0	923.31	28.05	1662.6	1495.1	253263	249524	0.750

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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Loss diagram
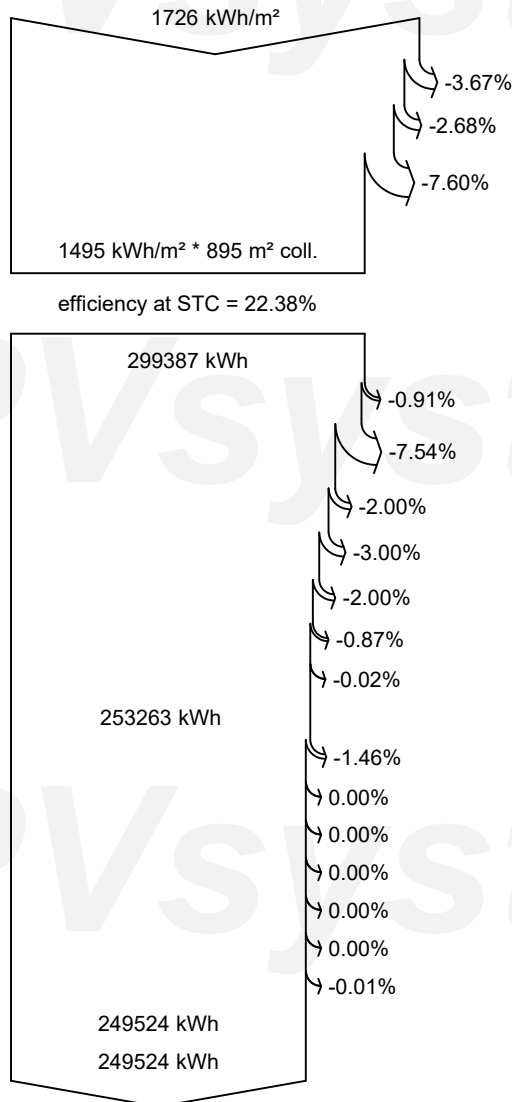
1726 kWh/m²	**Global horizontal irradiation**
-3.67%	**Global incident in coll. plane**
-2.68%	IAM factor on global
-7.60%	Soiling loss factor
1495 kWh/m² * 895 m² coll.	**Effective irradiation on collectors**
efficiency at STC = 22.38%	PV conversion
299387 kWh	**Array nominal energy (at STC effic.)**
-0.91%	PV loss due to irradiance level
-7.54%	PV loss due to temperature
-2.00%	Module quality loss
-3.00%	LID - Light induced degradation
-2.00%	Module array mismatch loss
-0.87%	Ohmic wiring loss
-0.02%	Mixed orientation mismatch loss
253263 kWh	**Array virtual energy at MPP**
-1.46%	Inverter Loss during operation (efficiency)
0.00%	Inverter Loss over nominal inv. power
0.00%	Inverter Loss due to max. input current
0.00%	Inverter Loss over nominal inv. voltage
0.00%	Inverter Loss due to power threshold
0.00%	Inverter Loss due to voltage threshold
-0.01%	Night consumption
249524 kWh	**Available Energy at Inverter Output**
249524 kWh	**Energy injected into grid**

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Predef. graphs

Daily Input/Output diagram

○ Values from 01/01 to 12/31

Y-axis: Useful out system energy [kWh/day]
X-axis: Global incident in coll. plane [kWh/m²/day]
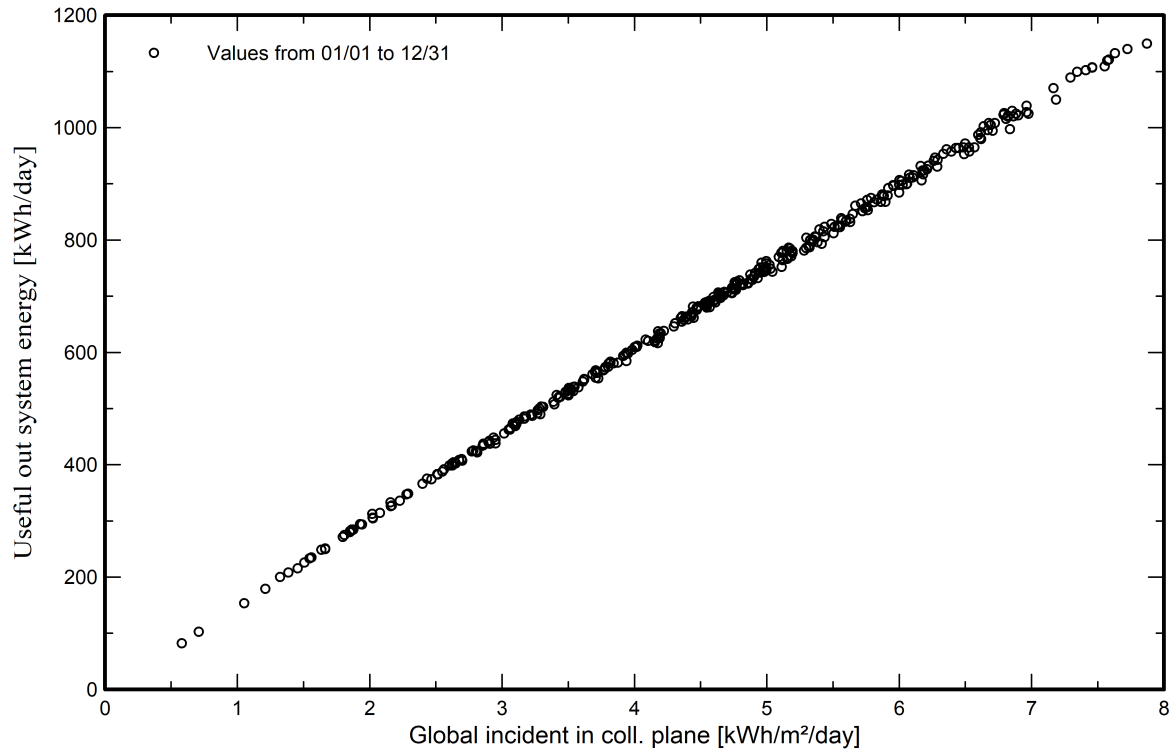
System Output Power Distribution

─── Values from 01/01 to 12/31

Y-axis: Useful out system energy [MWh / class of 2 kW]
X-axis: Useful out system energy [kW]

e-line diagram not avai