

PVsyst - Simulation report

Grid-Connected System

Project: 2MW Hasheminejad Refinery PV Solar Power Plant

Variant: New simulation variant

Sheds on ground

System power: 2002 kWp

Sarakhs - Iran

Author

Moham Shargh (Iran, Islamic Republic Of)



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VC0, Simulation date:
02/07/26 12:26
with V8.1.3

Moham Shargh (Iran, Islamic Republic Of)

Project summary

Geographical Site

Sarakhs

Iran

Situation

Latitude 36.5269 °(N)

Longitude 61.1661 °(E)

Altitude 273 m

Time zone UTC+3.5

Project settings

Albedo 0.20

Weather data

Sarakhs

Meteonorm 8.2 (1980-2000), Sat=99% - Synthetic

System summary

Grid-Connected System

Orientation #1

Fixed plane

Tilt/Azimuth 30 / -9 °

Sheds on ground

Near Shadings

Linear shadings : Slow (simul.)

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 2820 units

Pnom total 2002 kWp

Inverters

Nb. of units 14 units

Total power 2100 kWac

Pnom ratio 0.95

Results summary

Simulation step Hourly

Produced Energy	3530954 kWh/year	Specific production	1764 kWh/kWp/year	Perf. Ratio PR	86.23 %
				Bifacial perf. ratio	82.69 %

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General parameters

Grid-Connected System

Simulation step

Hourly

Orientation #1

Fixed plane

Tilt/Azimuth 30 / -9 °

Sheds on ground

Sheds configuration

Nb. of sheds 71 units

Set of tables

Shading limit angle

Limit profile angle 24.1 °

Sizes

Sheds spacing 9.50 m

Sensitive width 4.79 m

GCR Shading 50.4 %

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Free Horizon

Near Shadings

Linear shadings : Slow (simul.)

Bifacial system definition

Orientation #1

Bifacial system

Model Unlimited Sheds 2D Model

Bifacial model geometry

Sheds spacing 9.50 m

Sheds width 4.79 m

Limit profile angle 24.1 °

GCR Bifacial 50.4 %

Height above ground 1.00 m

Nb. of sheds 13 units

Bifacial model definitions

Ground albedo 0.20

Bifaciality factor 80 %

Rear shading factor 5.0 %

Rear mismatch loss 10.0 %

Shed transparent fraction 0.0 %

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer Trina solar

Model TSM-NEG-21C-20-710 Vertex

(Original PVsyst database)

Unit Nom. Power 710 Wp

Number of PV modules 2820 units

Nominal (STC) 2002 kWp

Modules 141 units x 20 In series

At operating cond. (50°C)

Pmpp 1857 kWp

U mpp 752 V

I mpp 2470 A

Total PV power

Nominal (STC) 2002 kWp

Total 2820 modules

Module area 8760 m²

Cell area 8208 m²

Inverter

Manufacturer Huawei Technologies

Model SUN2000-150K-MG0-400V

(Original PVsyst database)

Unit Nom. Power 150 kWac

Number of inverters 14 units

Total power 2100 kWac

Operating voltage 200-1000 V

Max. power (=>30°C) 165 kWac

Pnom ratio (DC:AC) 0.95

Power sharing within this inverter

Total inverter power

Total power 2100 kWac

Max. power 2310 kWac

Number of inverters 14 units

Pnom ratio 0.95



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Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 3.3 mΩ

Loss Fraction 1.00 % at STC

Serie Diode Loss

Voltage drop 0.7 V

Loss Fraction 0.1 % at STC

LID - Light Induced Degradation

Loss Fraction 0.70 %

Module Quality Loss

Loss Fraction -0.38 %

Module mismatch losses

Loss Fraction 2.00 % 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	0.963	0.892	0.814	0.679	0.438	0.000

System losses

Unavailability of the system

Time fraction 0.5 %

1.8 days,

2 periods

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 400 Vac tri

Loss Fraction 0.77 % at STC

Inverter: SUN2000-150K-MG0-400V

Wire section (14 Inv.) Copper 14 x 3 x 150 mm²

Average wires length 70 m

MV line up to Injection

MV Voltage 10 kV

Average each transformer

Wires Copper 3 x 70 mm²

Length 80 m

Loss Fraction 0.02 % at STC

AC losses in transformers

MV transfo

Medium voltage 10 kV

One transfo parameters

Nominal power at STC 980 kVA

Iron Loss (24/24 Connexion) 0.99 kVA

Iron loss fraction 0.10 % at STC

Copper loss 9.22 kVA

Copper loss fraction 0.94 % at STC

Coils equivalent resistance 3 x 1.53 mΩ

Operating losses at STC (full system)

Nb. identical MV transfos 2

Nominal power at STC 1.96 MVA

Iron loss (24/24 Connexion) 1.97 kVA

Copper loss 18.43 kVA



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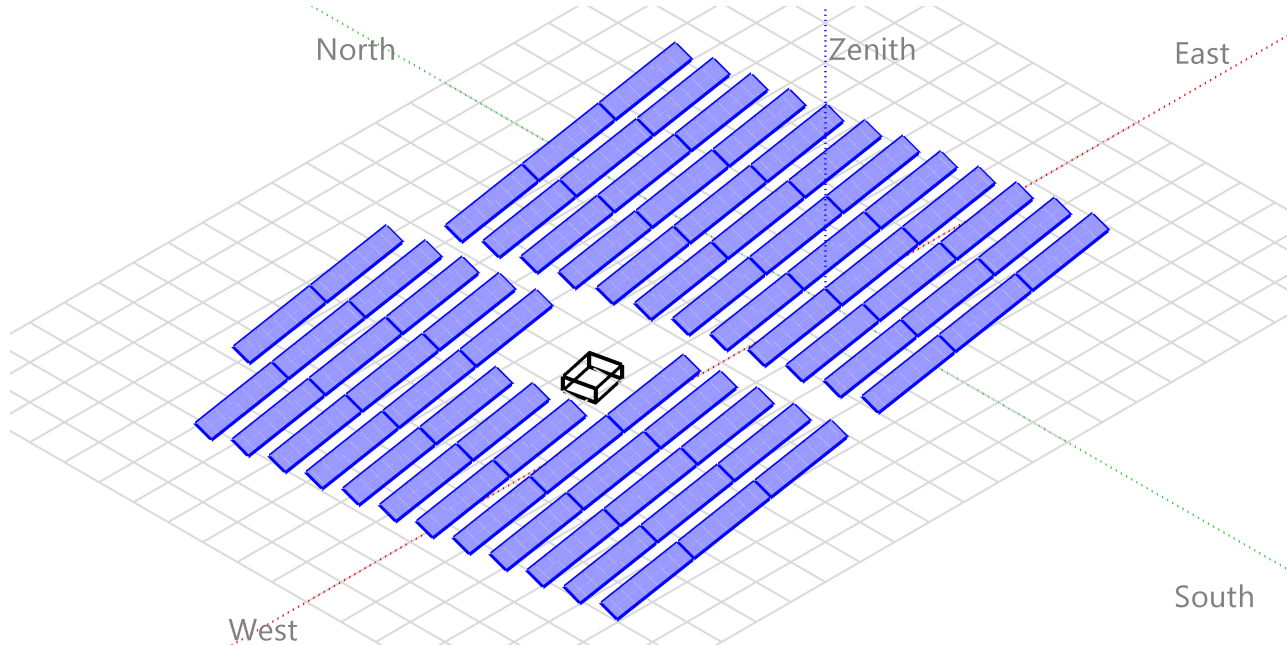
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Near shadings parameter

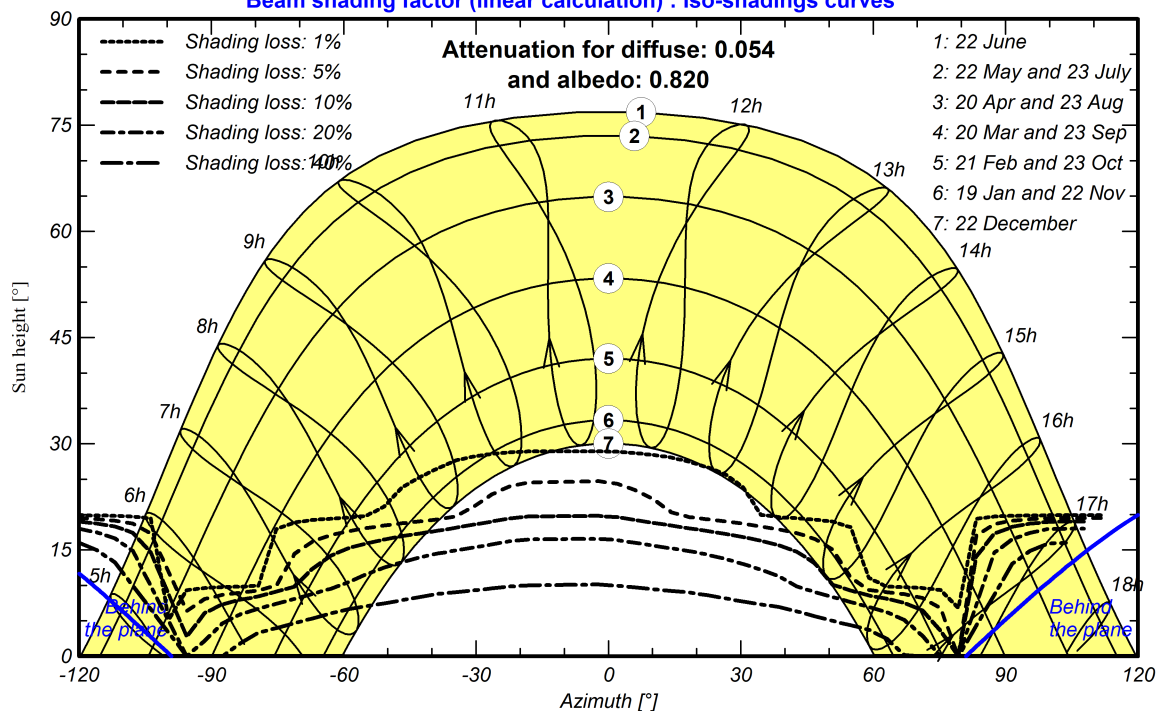
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1 - Fixed plane, Tilts/azimuths: 30°/-9°

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





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Main results

Simulation step

Hourly

System Production

Produced Energy 3530954 kWh/year

Specific production

1764 kWh/kWp/year

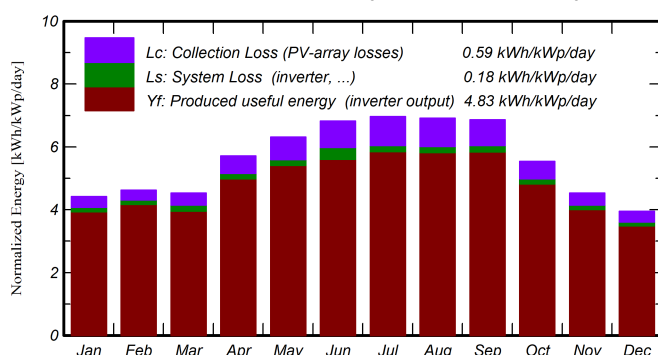
Perf. Ratio PR

86.23 %

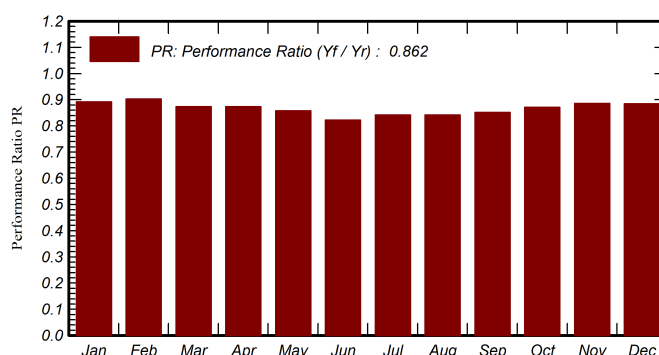
Bifacial perf. ratio

82.69 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR	PRBifi
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio	ratio
January	85.2	29.24	5.89	137.2	127.0	253346	244846	0.892	0.869
February	94.0	39.46	7.29	129.5	121.3	242111	233988	0.902	0.872
March	121.9	67.12	13.16	140.5	130.5	257607	245601	0.873	0.837
April	160.6	80.50	18.55	171.3	159.4	309865	299755	0.874	0.835
May	199.5	89.60	25.67	195.8	182.0	347328	336165	0.858	0.814
June	217.1	89.36	29.95	204.8	190.6	359937	336979	0.822	0.777
July	225.2	81.71	32.15	215.8	201.1	375576	363502	0.841	0.797
August	205.8	74.84	29.96	214.4	200.5	373625	361473	0.842	0.804
September	174.7	49.34	24.47	206.0	193.6	363365	351142	0.851	0.821
October	128.9	48.20	18.14	171.6	161.1	309615	299384	0.871	0.842
November	89.6	34.93	10.79	135.9	126.6	249393	241132	0.886	0.861
December	75.1	30.90	6.72	122.5	112.5	224347	216987	0.885	0.863
Year	1777.6	715.21	18.63	2045.2	1906.2	3666114	3530954	0.862	0.827

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

PRBifi Bifacial Performance Ratio



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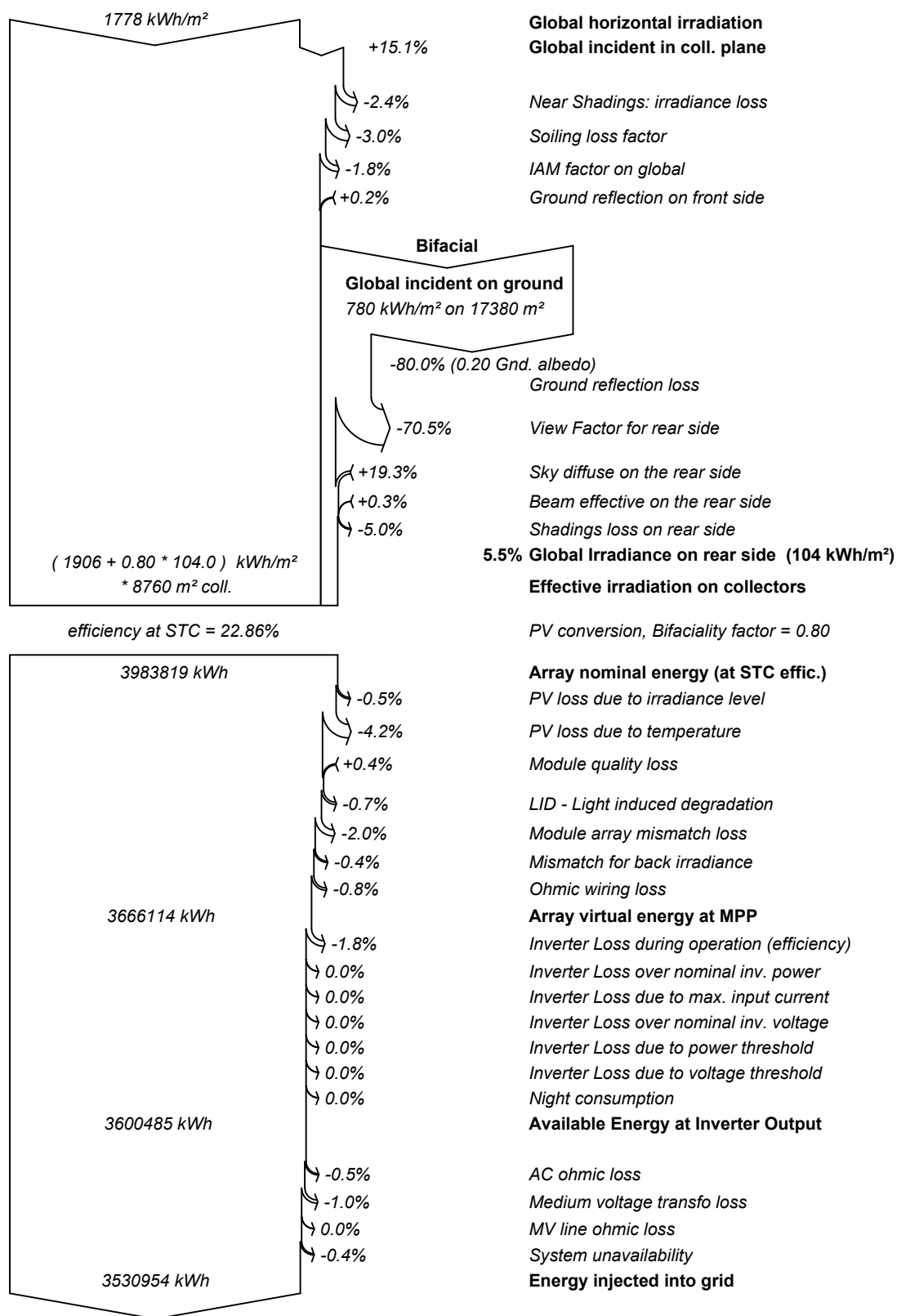


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Loss diagram





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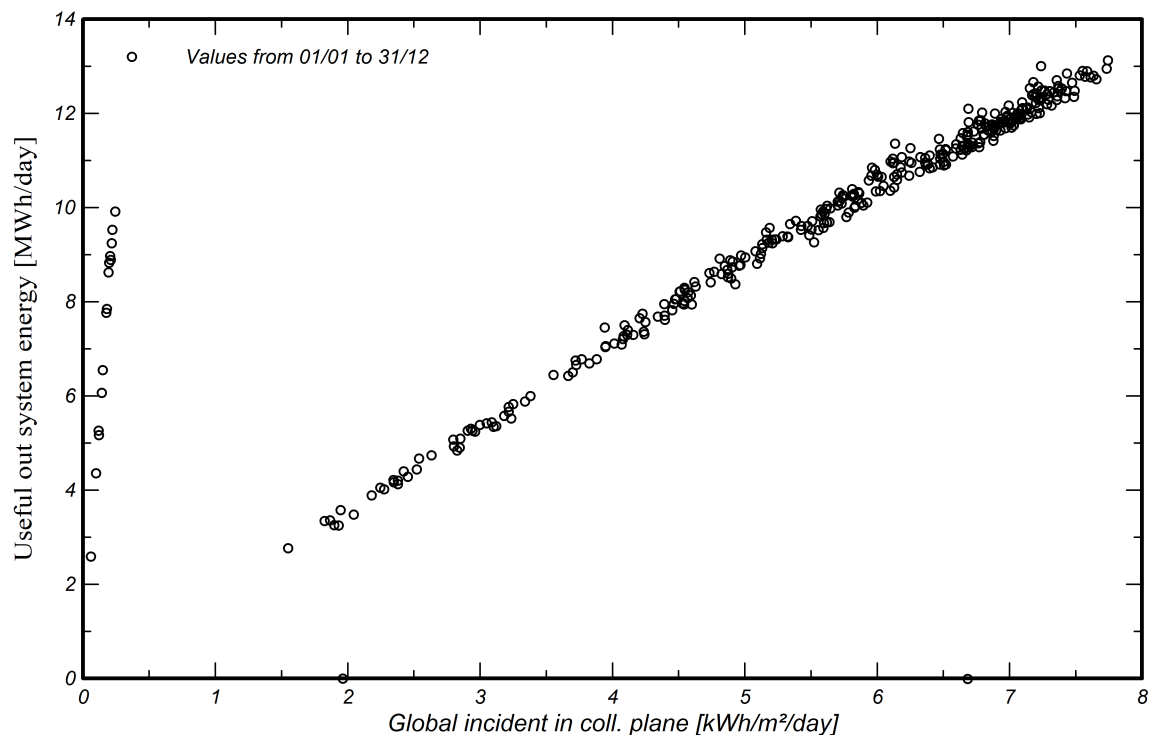
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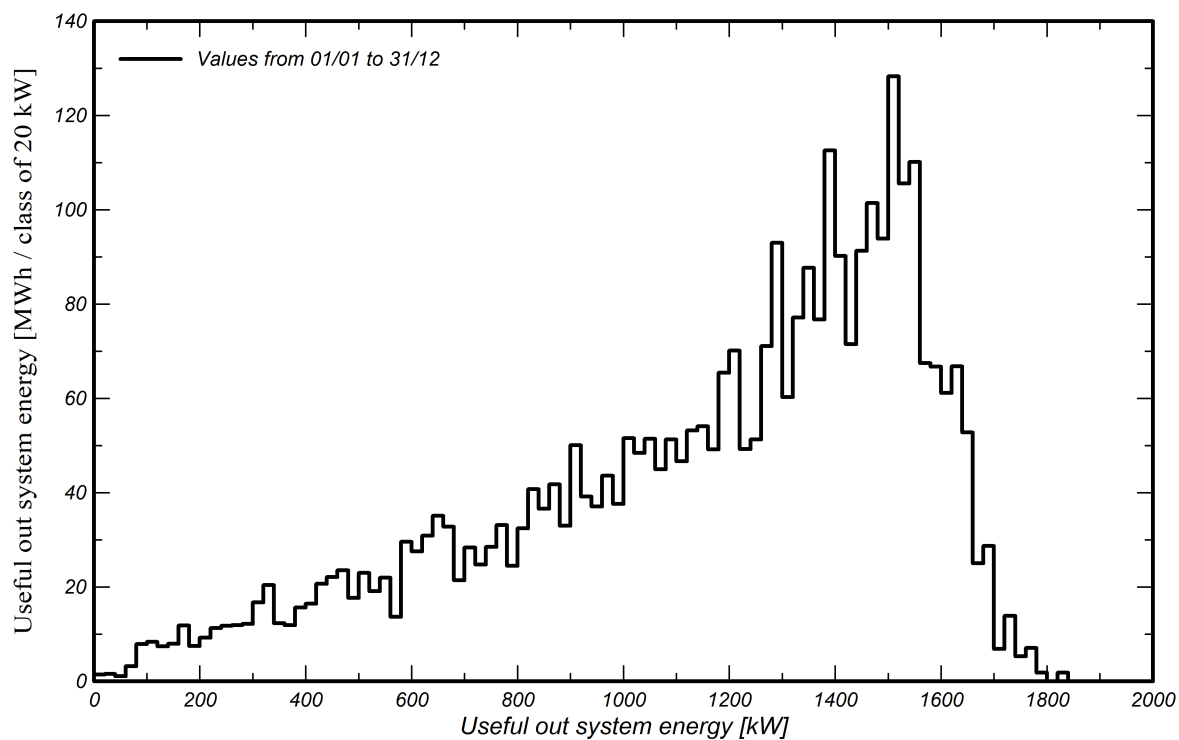
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Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





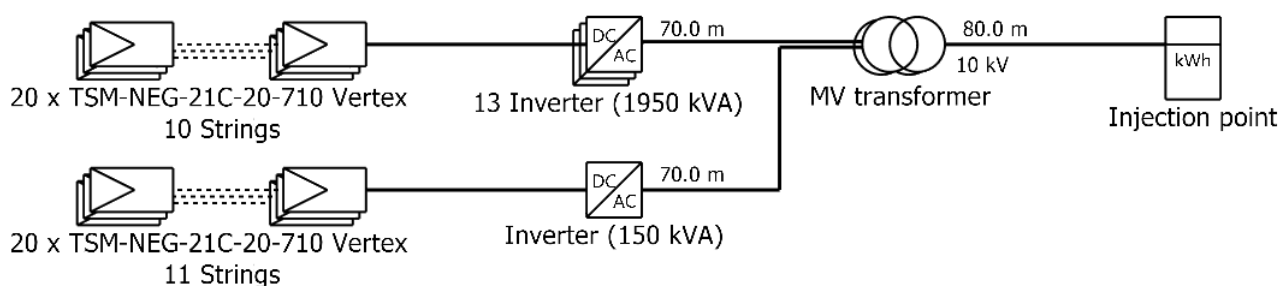
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Single-line diagram



PV module	TSM-NEG-21C-20-710 Vertex
Inverter	SUN2000-150K-MG0-400V
String	20 x TSM-NEG-21C-20-710 Vertex



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