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Grid-Connected System: Simulation parameters

Project: PVPMC\_Challenge\_1and2

Geographical Site ABQ Country United States

Situation Latitude 35.05° N Longitude -106.64° W Time defined as Legal Time Time zone UT-7 Altitude 1600 m

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

Meteo data: ABQ 2019

Simulation variant: S1

Simulation date 10/10/21 17h54

Simulation parameters System type No 3D scene defined, no shadings

Collector Plane Orientation Tilt 35° Azimuth 180°

Models used Transposition Perez Diffuse Imported

Horizon Free Horizon

Near Shadings No Shadings

User's needs: Unlimited load (grid)

PV Array Characteristics

PV module HIT Model VBHN325SA16
Custom parameters definition Manufacturer Panasonic

Number of PV modules In series 7 modules In parallel 6 strings
Total number of PV modules Nb. modules 42 Unit Nom. Power 325 Wp

Array global power Nominal (STC) 13.65 kWp At operating cond. 12.87 kWp (50°C)

Array operating characteristics (50°C)

U mpp 379 V

I mpp 34 A

Total area

Module area 70.3 m<sup>2</sup>

Cell area 61.4 m<sup>2</sup>

Inverter Model Sunny Tripower 20000TL-30

Original PVsyst database Manufacturer SMA

Characteristics Operating Voltage 320-800 V Unit Nom. Power 20.0 kWac

Inverter pack Nb. of inverters 1 units Total Power 20 kWac

Pnom ratio 0.68

PV Array loss factors

Thermal Loss factor Uc (const) 20.0 W/m<sup>2</sup>K Uv (wind) 0.0 W/m<sup>2</sup>K / m/s

Wiring Ohmic Loss Global array res. 183 mOhm Loss Fraction 1.5 % at STC

Module Quality Loss Loss Fraction 2.5 %

Module Mismatch Losses Loss Fraction 1.0 % at MPP

Strings Mismatch loss Loss Fraction 0.10 %

Incidence effect, ASHRAE parametrization IAM = 1 - bo (1/cos i - 1) bo Param. 0.05

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Grid-Connected System: Main results

Project: PVPMC\_Challenge\_1and2

Simulation variant: S1

Main system parameters System type No 3D scene defined, no shadings

**PV Field Orientation** azimuth 180° tilt PV modules Model VBHN325SA16 Pnom 325 Wp PV Array Nb. of modules 42 Pnom total 13.65 kWp Inverter Model Sunny Tripower 20000TL-30 20.00 kW ac

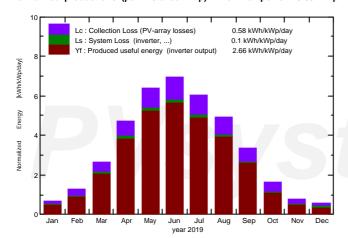
User's needs Unlimited load (grid)

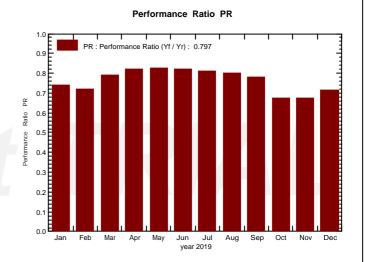
Main simulation results

System Production Produced Energy 13.28 MWh/year Specific prod. 973 kWh/kWp/year

Performance Ratio PR 79.69 %

## Normalized productions (per installed kWp): Nominal power 13.65 kWp





S1
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
Jan. 19	96.3	25.32	2.33	21.7	20.4	0.244	0.218	0.738
Feb. 19	108.8	31.85	3.91	35.9	30.4	0.374	0.351	0.717
Mar. 19	156.1	50.71	7.65	82.0	73.5	0.919	0.884	0.790
Apr. 19	210.5	43.12	10.83	141.9	132.1	1.640	1.590	0.821
May 19	248.7	41.47	15.05	198.0	188.8	2.293	2.227	0.824
June 19	244.6	43.96	18.61	208.1	200.1	2.394	2.325	0.818
July 19	227.7	56.65	18.80	187.6	180.3	2.143	2.077	0.811
Aug. 19	208.8	55.59	18.01	152.6	144.7	1.724	1.669	0.802
Sep. 19	175.9	47.38	13.63	100.9	92.0	1.116	1.078	0.782
Oct. 19	151.4	24.74	9.93	51.3	42.1	0.503	0.474	0.676
Nov. 19	104.5	25.31	6.07	23.1	20.4	0.237	0.212	0.673
Dec. 19	94.0	19.92	2.39	17.3	16.6	0.194	0.169	0.717
Year	2027.5	466.02	10.64	1220.4	1141.5	13.783	13.275	0.797

Legends: GlobHor

Horizontal global irradiation

Horizontal diffuse irradiation

T\_Amb T amb

GlobInc

DiffHor

Global incident in coll. plane

GlobEff EArray E\_Grid

PR

Effective Global, corr. for IAM and shadings Effective energy at the output of the array

Energy injected into grid Performance Ratio

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Grid-Connected System: Special graphs

Project: PVPMC\_Challenge\_1and2

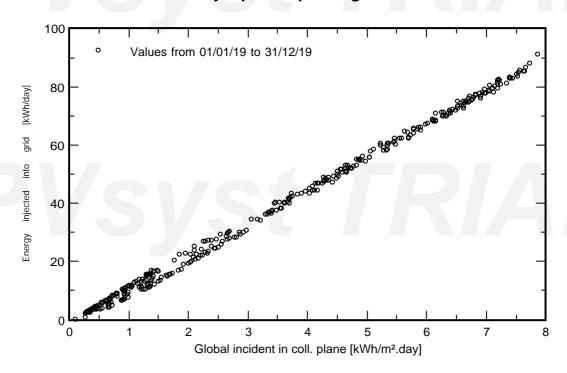
Simulation variant: S1

Main system parameters System type No 3D scene defined, no shadings

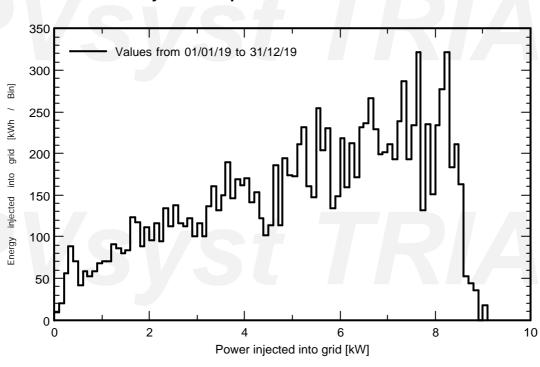
**PV Field Orientation** 180° azimuth tilt VBHN325SA16 PV modules Model Pnom 325 Wp PV Array Nb. of modules 42 Pnom total 13.65 kWp 20.00 kW ac Inverter Model Sunny Tripower 20000TL-30

User's needs Unlimited load (grid)

## **Daily Input/Output diagram**



## **System Output Power Distribution**



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Grid-Connected System: Loss diagram

Project: PVPMC\_Challenge\_1and2

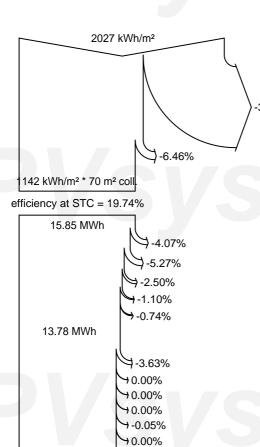
Simulation variant: **S1** 

Main system parameters No 3D scene defined, no shadings System type

**PV Field Orientation** 180° azimuth Model PV modules VBHN325SA16 Pnom 325 Wp PV Array Nb. of modules 42 Pnom total 13.65 kWp Inverter 20.00 kW ac

Model Sunny Tripower 20000TL-30 User's needs Unlimited load (grid)

## Loss diagram over the whole year



13.28 MWh

13.28 MWh

Horizontal global irradiation

-39.86% bal incident in coll. plane

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level PV loss due to temperature Module quality loss

Mismatch loss, modules and strings

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency) Inverter Loss over nominal inv. power Inverter Loss due to max. input current Inverter Loss over nominal inv. voltage Inverter Loss due to power threshold Inverter Loss due to voltage threshold

Available Energy at Inverter Output

Energy injected into grid