NEX 088a - Monreale
Comuni: Monreale
Città metropolitana: Palermo (PA)
Regione: Sicilia

Nome Progetto:

NEX 088a - Monreale
Progetto di un impianto agrivoltaico sito nel comune di Monreale in località "C. da Marcanza" di potenza nominale pari a 37,46 MWp in DC

Proponente:

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Consulenza ambientale e progettazione:

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PROGETTO DEFINITIVO

Nome documento:

Stima Producibilità Impianto

Commessa	Codice elaborato	Nome file
30200208	PRO_REL_11	PRO_REL_11 - Stima Producibilità FV

00	Mar. 24	Prima Emissione	MA	SDA	SDA
Rev.	**Data**	**Oggetto revisione**	**Redatto**	**Verificato**	**Approvato**

Version 7.4.5

PVsyst - Simulation report

Grid-Connected System

Project: monreale

Variant: New simulation variant

Unlimited trackers

System power: 37.46 MWp

Monreale - Italy

Author
ARCADIS (italy)

Project: monreale

Variant: New simulation variant

ARCADIS (italy)

Project summary

Geographical Site
Monreale
Italy

Situation

Latitude	38.08 °N
Longitude	13.29 °E
Altitude	334 m
Time zone	UTC+1

Project settings

Albedo	0.20

Meteo data
Monreale
PVGIS api TMY

System summary

Grid-Connected System

Unlimited trackers

PV Field Orientation
Orientation
Tracking horizontal axis

Tracking algorithm
Astronomic calculation

Near Shadings
No Shadings

System information

PV Array

Nb. of modules	54292 units
Pnom total	37.46 MWp

Inverters

Nb. of units	11 units
Pnom total	41.33 MWac
Pnom ratio	0.906

User's needs
Unlimited load (grid)

Results summary

Produced Energy	77163750 kWh/year	Specific production	2060 kWh/kWp/year	Perf. Ratio PR	82.99 %

Table of contents

General parameters

Grid-Connected System | **Unlimited trackers**

PV Field Orientation

Orientation
Tracking horizontal axis

Tracking algorithm
Astronomic calculation

Trackers configuration

Nb. of trackers	2080	units
Unlimited trackers		

Sizes

Tracker Spacing	6.70	m
Collector width	2.38	m
Ground Cov. Ratio (GCR)	35.5	%
Left inactive band	0.02	m
Right inactive band	0.02	m
Phi min / max.	-/+ 55.0	°

Shading limit angles

Phi limits for BT	-/+ 68.9	°

Models used

Transposition	Perez
Diffuse	Imported
Circumsolar	separate

Horizon
Free Horizon

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

Bifacial system

Model: 2D Calculation unlimited trackers

Bifacial model geometry

Tracker Spacing	6.70	m
Tracker width	2.42	m
GCR	36.1	%
Axis height above ground	1.81	m

Bifacial model definitions

Ground albedo	0.20	
Bifaciality factor	72	%
Rear shading factor	17.0	%
Rear mismatch loss	10.0	%
Shed transparent fraction	0.0	%

PV Array Characteristics

PV module

Manufacturer	Trina Solar
Model	TSM-DEG21C-20-690Wp Vertex
(Custom parameters definition)	
Unit Nom. Power	690 Wp
Number of PV modules	47208 units
Nominal (STC)	32.57 MWp

Inverter

Manufacturer	SMA
Model	Sunny Central 4000 UP
(Original PVsyst database)	
Unit Nom. Power	4000 kWac
Number of inverters	9 units
Total power	36000 kWac

Array #1 - Array 1

Number of PV modules	4732 units	Number of inverters	1 unit
Nominal (STC)	3265 kWp	Total power	4000 kWac
Modules	169 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	2991 kWp	Pnom ratio (DC:AC)	0.82
U mpp	1017 V		
I mpp	2940 A		

PV Array Characteristics

Array #2 - Sub-array #2

Number of PV modules	4704 units	Number of inverters	1 unit
Nominal (STC)	3246 kWp	Total power	4000 kWac
Modules	168 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	2973 kWp	Pnom ratio (DC:AC)	0.81
U mpp	1017 V		
I mpp	2922 A		

Array #3 - Sub-array #3

Number of PV modules	4760 units	Number of inverters	1 unit
Nominal (STC)	3284 kWp	Total power	4000 kWac
Modules	170 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3009 kWp	Pnom ratio (DC:AC)	0.82
U mpp	1017 V		
I mpp	2957 A		

Array #4 - Sub-array #4

Number of PV modules	5488 units	Number of inverters	1 unit
Nominal (STC)	3787 kWp	Total power	4000 kWac
Modules	196 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3469 kWp	Pnom ratio (DC:AC)	0.95
U mpp	1017 V		
I mpp	3410 A		

Array #5 - Sub-array #5

Number of PV modules	5488 units	Number of inverters	1 unit
Nominal (STC)	3787 kWp	Total power	4000 kWac
Modules	196 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3469 kWp	Pnom ratio (DC:AC)	0.95
U mpp	1017 V		
I mpp	3410 A		

Array #6 - Sub-array #6

Number of PV modules	5460 units	Number of inverters	1 unit
Nominal (STC)	3767 kWp	Total power	4000 kWac
Modules	195 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3451 kWp	Pnom ratio (DC:AC)	0.94
U mpp	1017 V		
I mpp	3392 A		

Array #7 - Sub-array #7

Number of PV modules	5460 units	Number of inverters	1 unit
Nominal (STC)	3767 kWp	Total power	4000 kWac
Modules	195 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3451 kWp	Pnom ratio (DC:AC)	0.94
U mpp	1017 V		
I mpp	3392 A		

PV Array Characteristics

Array #8 - Sub-array #8

Number of PV modules	5488 units	Number of inverters	1 unit
Nominal (STC)	3787 kWp	Total power	4000 kWac
Modules	196 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3469 kWp	Pnom ratio (DC:AC)	0.95
U mpp	1017 V		
I mpp	3410 A		

Array #9 - Sub-array #9

Number of PV modules	5628 units	Number of inverters	1 unit
Nominal (STC)	3883 kWp	Total power	4000 kWac
Modules	201 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	3557 kWp	Pnom ratio (DC:AC)	0.97
U mpp	1017 V		
I mpp	3496 A		

PV module

Manufacturer	Trina Solar
Model	TSM-DEG21C-20-690Wp Vertex
(Custom parameters definition)	
Unit Nom. Power	690 Wp
Number of PV modules	7084 units
Nominal (STC)	4888 kWp

Inverter

Manufacturer	SMA
Model	Sunny Central 2660 UP
(Original PVsyst database)	
Unit Nom. Power	2667 kWac
Number of inverters	2 units
Total power	5334 kWac

Array #10 - Sub-array #10

Number of PV modules	3556 units	Number of inverters	1 unit
Nominal (STC)	2454 kWp	Total power	2667 kWac
Modules	127 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	2248 kWp	Pnom ratio (DC:AC)	0.92
U mpp	1017 V		
I mpp	2209 A		

Array #11 - Sub-array #11

Number of PV modules	3528 units	Number of inverters	1 unit
Nominal (STC)	2434 kWp	Total power	2667 kWac
Modules	126 string x 28 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	2230 kWp	Pnom ratio (DC:AC)	0.91
U mpp	1017 V		
I mpp	2192 A		

Total PV power

Nominal (STC)	37461 kWp
Total	54292 modules
Module area	168650 m²

Total inverter power

Total power	41334 kWac
Number of inverters	11 units
Pnom ratio	0.91

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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

LID - Light Induced Degradation
Loss Fraction 1.5 %

Module Quality Loss
Loss Fraction -0.3 %

Module mismatch losses
Loss Fraction 0.4 % 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	0.962	0.892	0.816	0.681	0.440	0.000

DC wiring losses

Global wiring resistance 0.66 mΩ
Loss Fraction 2.0 % at STC

Array #1 - Array 1
Global array res. 7.6 mΩ
Loss Fraction 2.0 % at STC

Array #2 - Sub-array #2
Global array res. 7.6 mΩ
Loss Fraction 2.0 % at STC

Array #3 - Sub-array #3
Global array res. 7.6 mΩ
Loss Fraction 2.0 % at STC

Array #4 - Sub-array #4
Global array res. 6.6 mΩ
Loss Fraction 2.0 % at STC

Array #5 - Sub-array #5
Global array res. 6.6 mΩ
Loss Fraction 2.0 % at STC

Array #6 - Sub-array #6
Global array res. 6.6 mΩ
Loss Fraction 2.0 % at STC

Array #7 - Sub-array #7
Global array res. 6.6 mΩ
Loss Fraction 2.0 % at STC

Array #8 - Sub-array #8
Global array res. 6.6 mΩ
Loss Fraction 2.0 % at STC

Array #9 - Sub-array #9
Global array res. 6.4 mΩ
Loss Fraction 2.0 % at STC

Array #10 - Sub-array #10
Global array res. 10 mΩ
Loss Fraction 2.0 % at STC

Array #11 - Sub-array #11
Global array res. 10 mΩ
Loss Fraction 2.0 % at STC

System losses

Unavailability of the system
Time fraction 2.0 %
7.3 days,
3 periods

Auxiliaries loss
constant (fans) 65.0 kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo
Inverter voltage 600 Vac tri
Loss Fraction 0.05 % at STC

Global System
Wire section Alu 3 x 30000 mm²
Wires length 5 m

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AC wiring losses

MV line up to Injection

MV Voltage	30	kV
Average each inverter		
Wires	Copper 3 x 240	mm²
Length	14669	m
Loss Fraction	0.43	% at STC

AC losses in transformers

MV transfo

Medium voltage	30	kV

One transfo parameters

Nominal power at STC	3.34	MVA
Iron Loss (24/24 Connexion)	3.34	kVA
Iron loss fraction	0.10	% at STC
Copper loss	33.45	kVA
Copper loss fraction	1.00	% at STC
Coils equivalent resistance	3 x 1.08	mΩ

Operating losses at STC (full system)

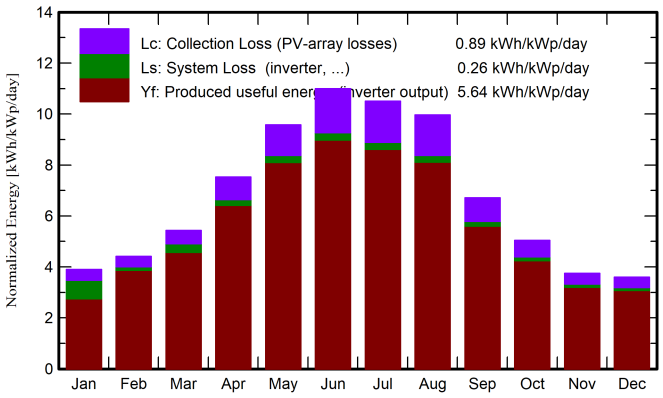
Nb. identical MV transfos	11	
Nominal power at STC	36.79	MVA
Iron loss (24/24 Connexion)	36.79	kVA
Copper loss	367.90	kVA

Main results

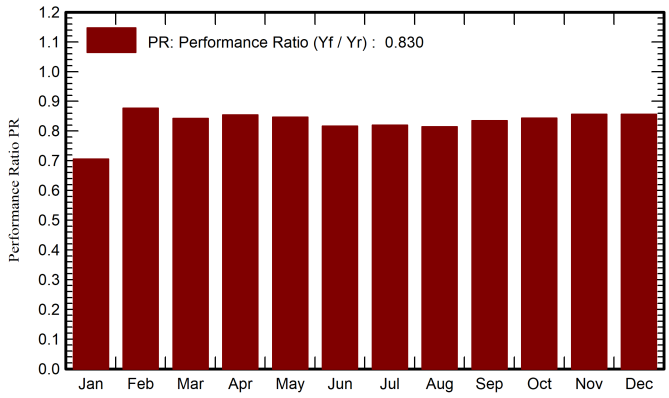
System Production

Produced Energy	77163750 kWh/year	Specific production	2060 kWh/kWp/year
		Perf. Ratio PR	82.99 %

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	80.6	31.85	8.16	121.0	108.6	4052961	3196390	0.705
February	87.8	37.78	7.29	123.6	113.5	4208528	4062184	0.877
March	124.1	54.14	9.65	168.4	157.9	5714285	5312357	0.842
April	168.8	68.02	13.68	225.7	212.2	7469463	7223662	0.854
May	221.1	69.13	16.00	296.7	283.7	9728921	9410741	0.847
June	242.3	65.59	22.84	329.9	314.7	10427486	10096567	0.817
July	240.0	66.58	23.87	325.8	312.4	10338013	10010563	0.820
August	220.1	61.25	24.12	308.9	292.9	9730073	9422876	0.814
September	149.0	53.62	21.61	201.5	190.1	6511530	6298611	0.834
October	110.5	46.75	18.80	156.3	144.1	5109702	4939295	0.843
November	78.3	38.70	12.61	112.6	101.2	3743194	3612576	0.856
December	74.5	30.65	9.38	111.5	99.3	3708477	3577929	0.856
Year	1796.9	624.06	15.71	2482.0	2330.6	80742632	77163750	0.830

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

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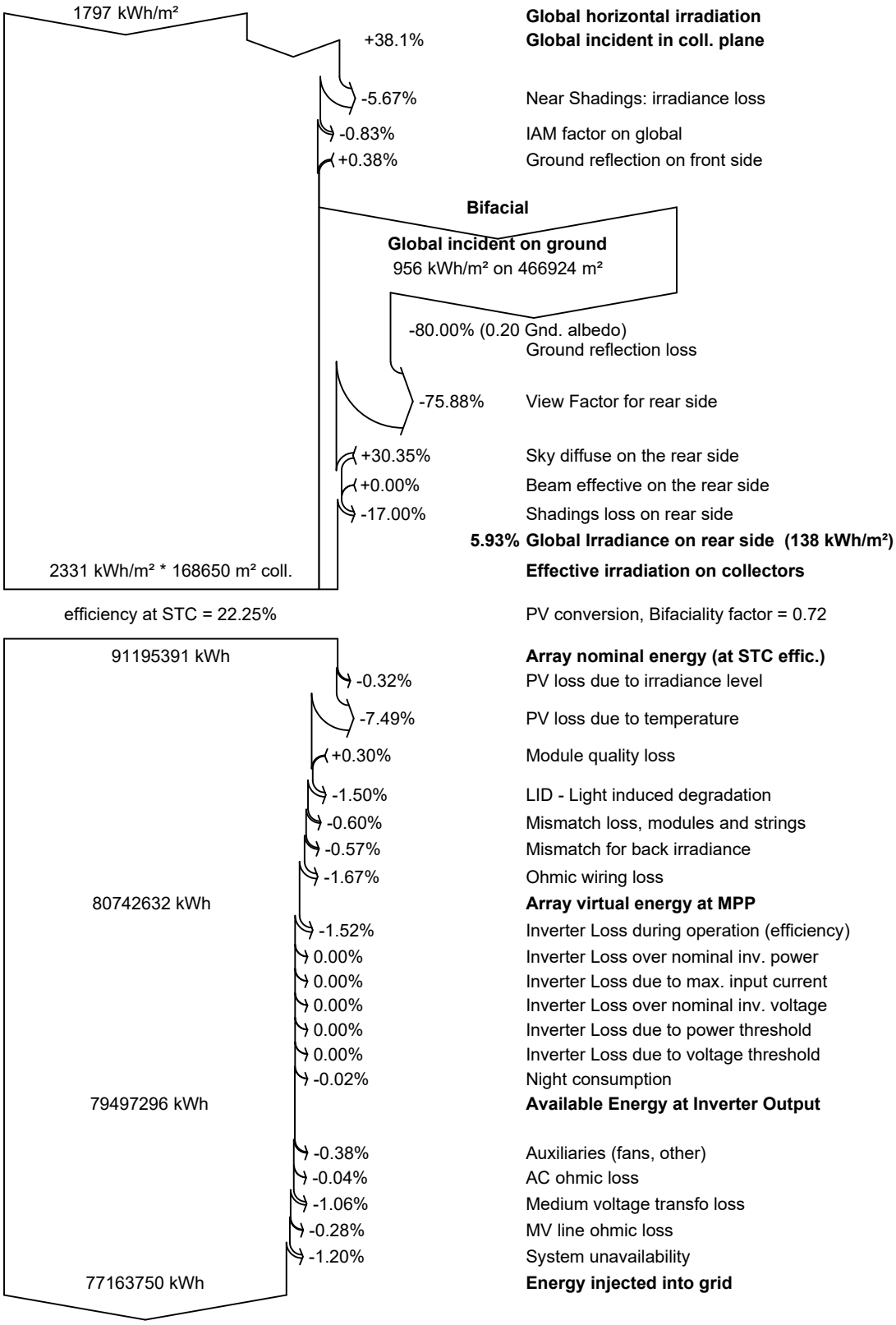
Loss diagram



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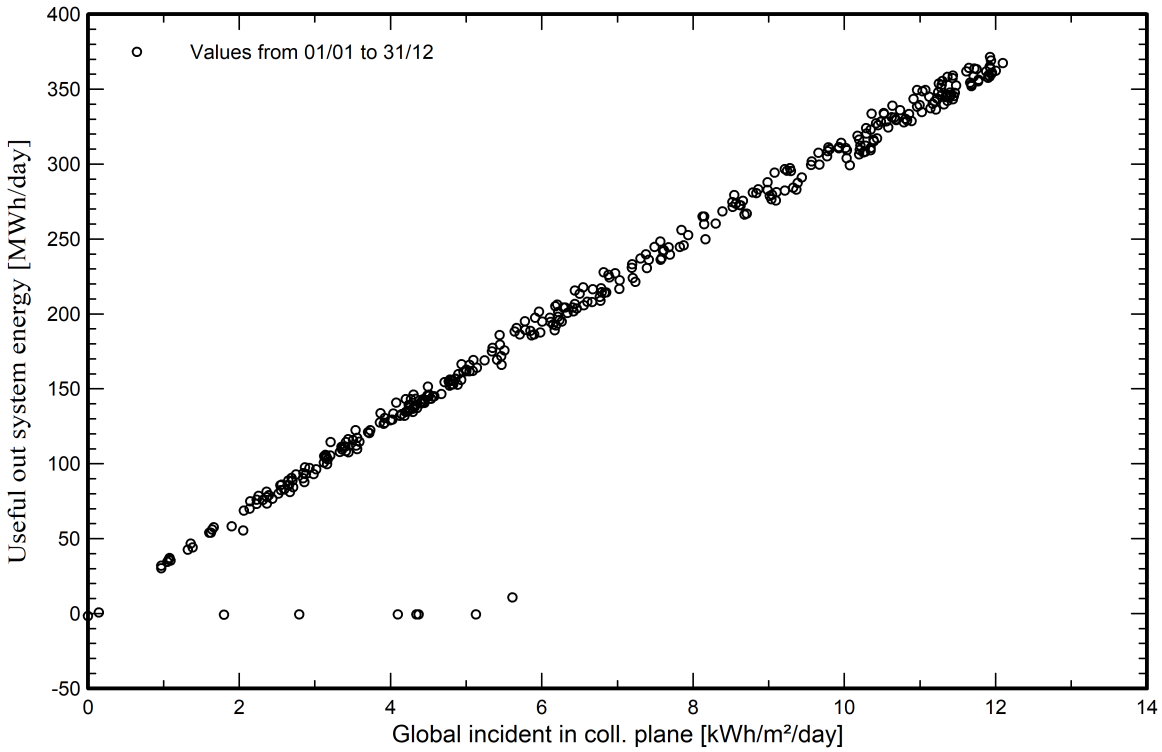
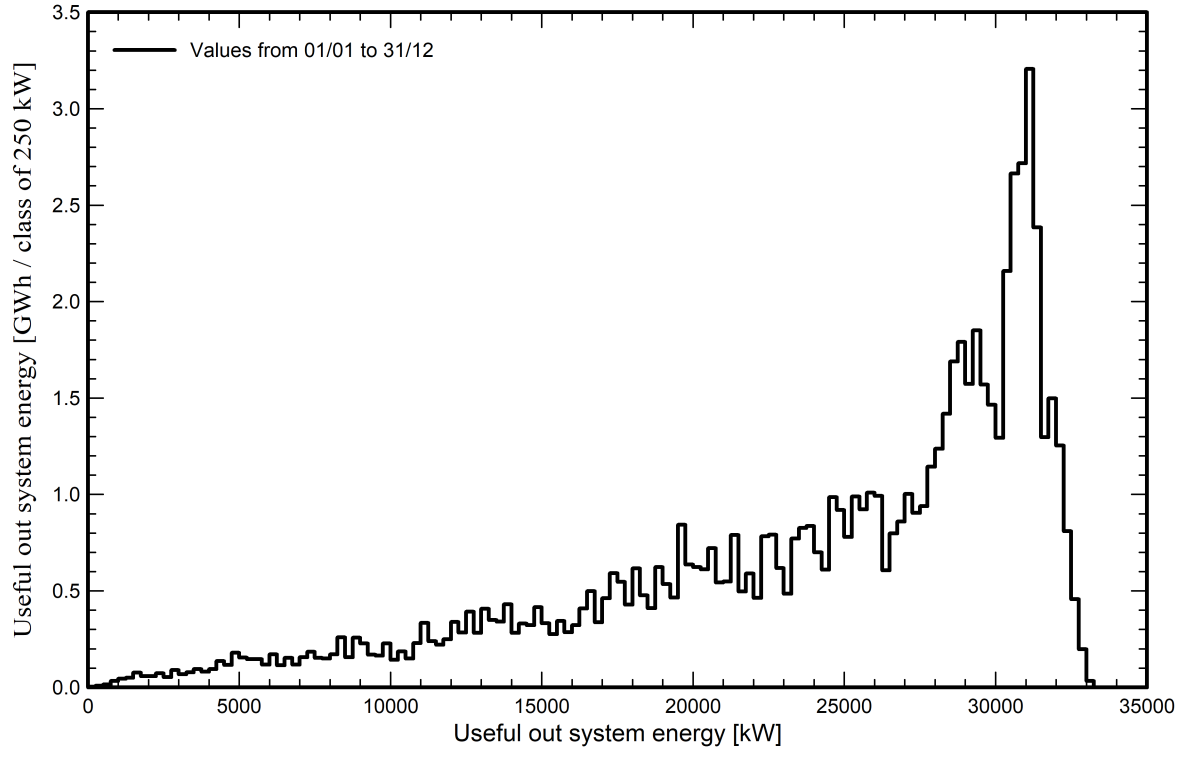
Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



Single-line diagram

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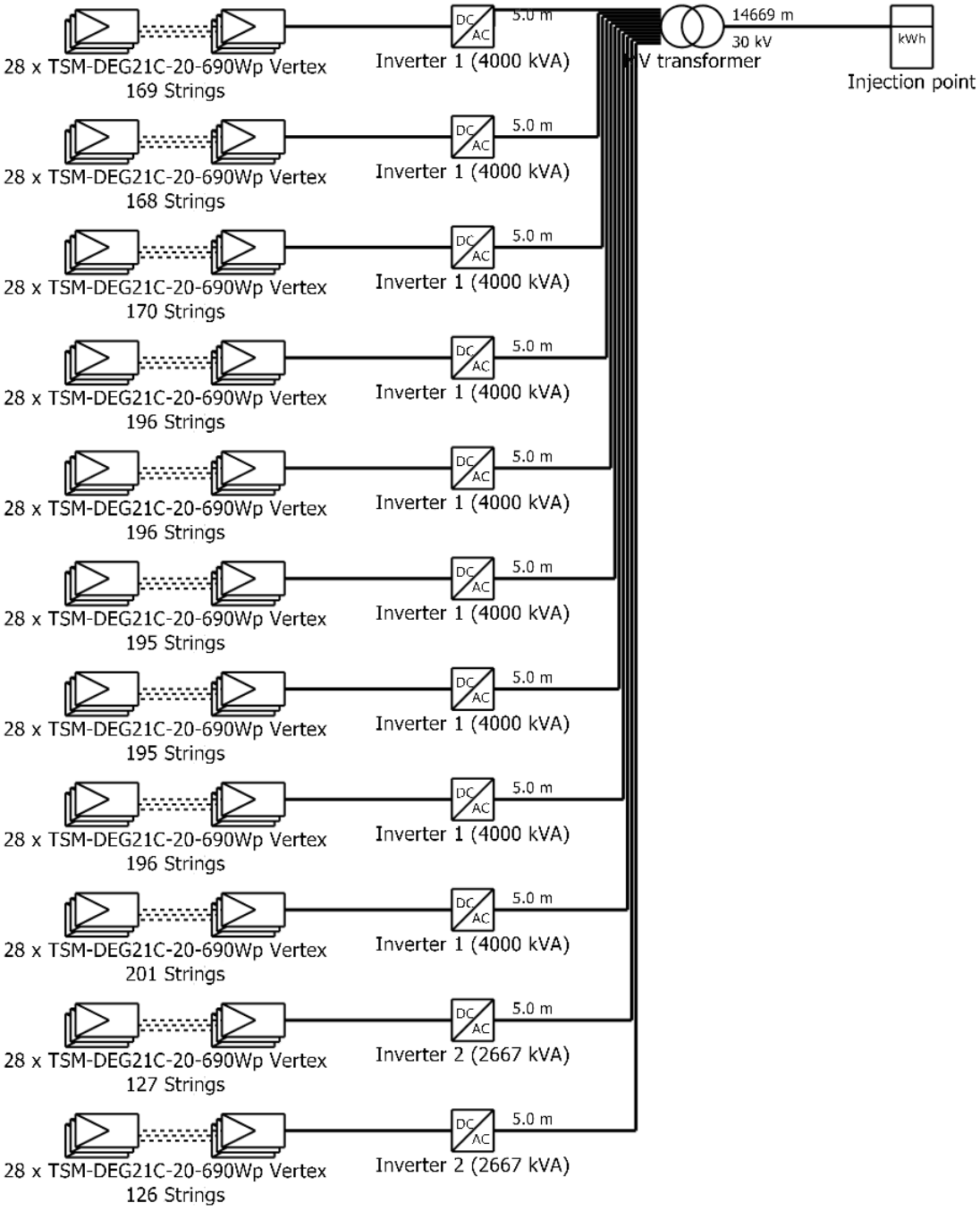

PV module	TSM-DEG21C-20-690Wp Vertex
Inverter 1	Sunny Central 4000 UP
Inverter 2	Sunny Central 2660 UP
String	28 x TSM-DEG21C-20-690Wp Vertex

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	VC3 : New simulation variant	01/03/24