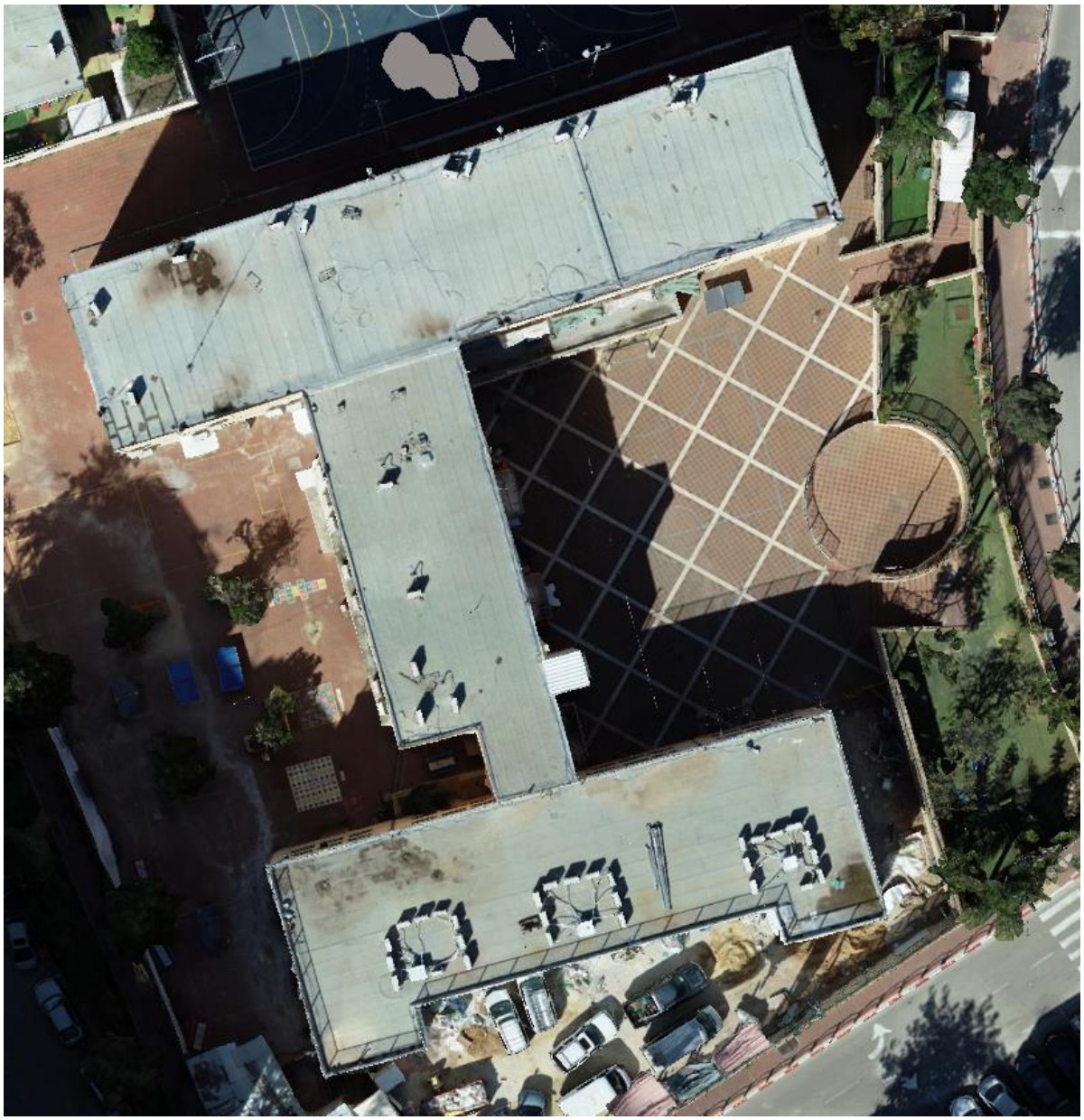
רמת גן – בית ספר גבעולים

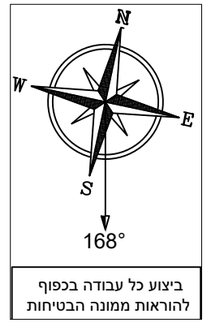
מערכת סולארית מתח נמוך – 124.655Kw



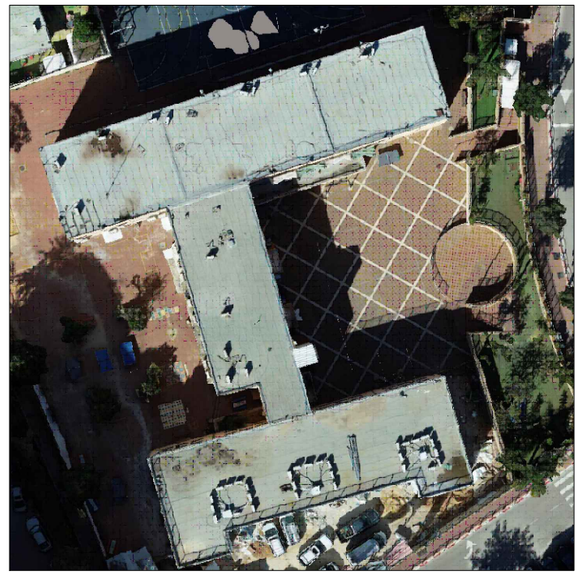
רשימת תוכניות:

- Givolim School - G001 – הצבת פאנלים
- Givolim School - G002 – חיווט פאנלים
- Givolim School - E001 – חד קווי
- Givolim School - C001 – סימולציה PVSyst
- Givolim School - C003 – חישוב הפסדי הולכה DC
- Givolim School - C004 – חישוב הפסדי הולכה AC

Givolim Design Layout



ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות

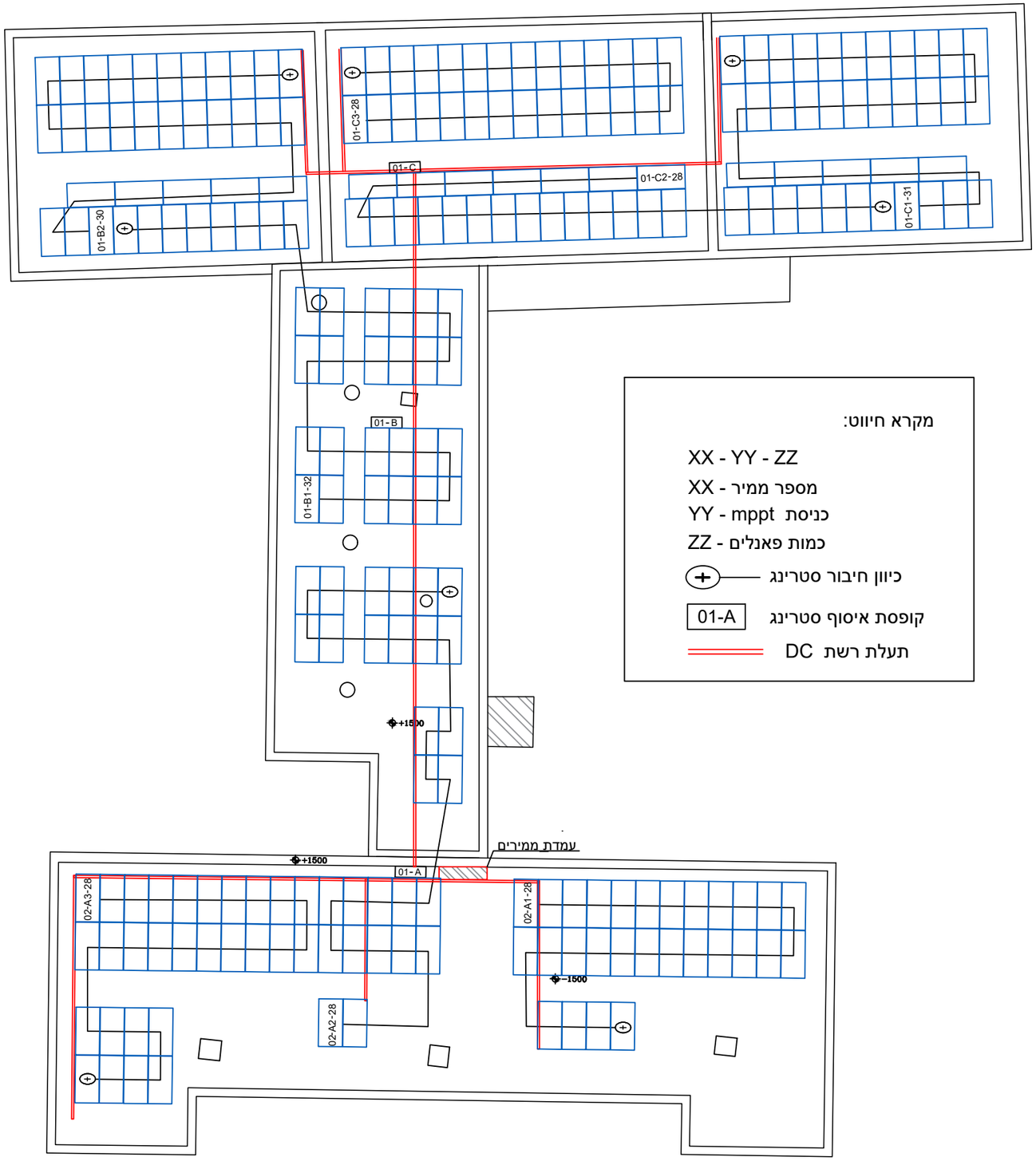


בית ספר גבעולים, רמת גן - חלוקה לסטרינגים/ממירים									
								535	הספק פאנל בודד(W)
								233	מ"ס פאנלים כללי :
								100	הספק כללי AC (KW) :
								124.655	הספק כללי DC (KW) :
								124.66%	יחס AC/DC :
גג	ממיר	סוג ממיר (kW)	כניסת mppt	מ"ס סטרינגים	אופטימייזרים P1100	מ"ס פאנלים	הספק DC (kW)	הספק AC (kW)	AC/DC
בטון	1	SE 100kW	Right	3	16	31	124.655	100	124.66%
					14	28			
			Center	2	14	28			
					16	32			
					15	30			
			Left	3	14	28			
					14	28			
					14	28			
סה"כ כמות:					117	233	124.655	100	124.66%

Title:	תוכנית הצבת פאנלים	DRAWING NUMBER:	Givolim school - G001	REV	DATE	DRAWN	COMMENTS	Panels		Inverters	Quant'
Client:	שחר אנרגיה	Site location:	רמת גן	A 1	14/07/21	Roi N.	Layout Update	Manuf:'	Chint [2256x1133x35]	Manuf:'	Solar Edge	
DATE:	14/07/2021	Scale:	####	Print size:	A3	Sheet :	1/1	Model:	535W	Model A:	50kW	2
Designer:	Roi Nakash							Quant:'	233	Model B:		
Approved:								Tilt:	18°\15°	Model C:		
STATUS :	לאישור	REV:	A 1					Azimuth:	168°	Model D:		
APPROVAL / STAMP								T.Power:	124.655kW	T.Power:	100kW	

ENERCITY RENEWABLE ENGINEERING

Givolim StringWiring



מקרא חיווט:

XX - YY - ZZ

XX - מספר ממיר

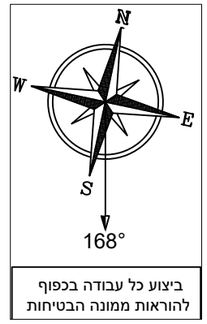
YY - mppt כניסת

ZZ - כמות פאנלים

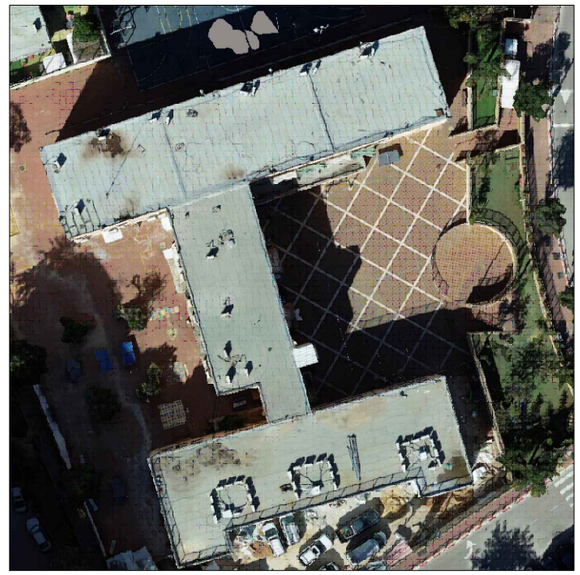
כיוון חיבור סטרינג

01-A קופסת איסוף סטרינג

DC תעלת רשת



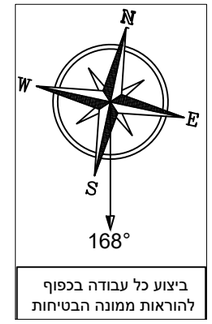
ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות

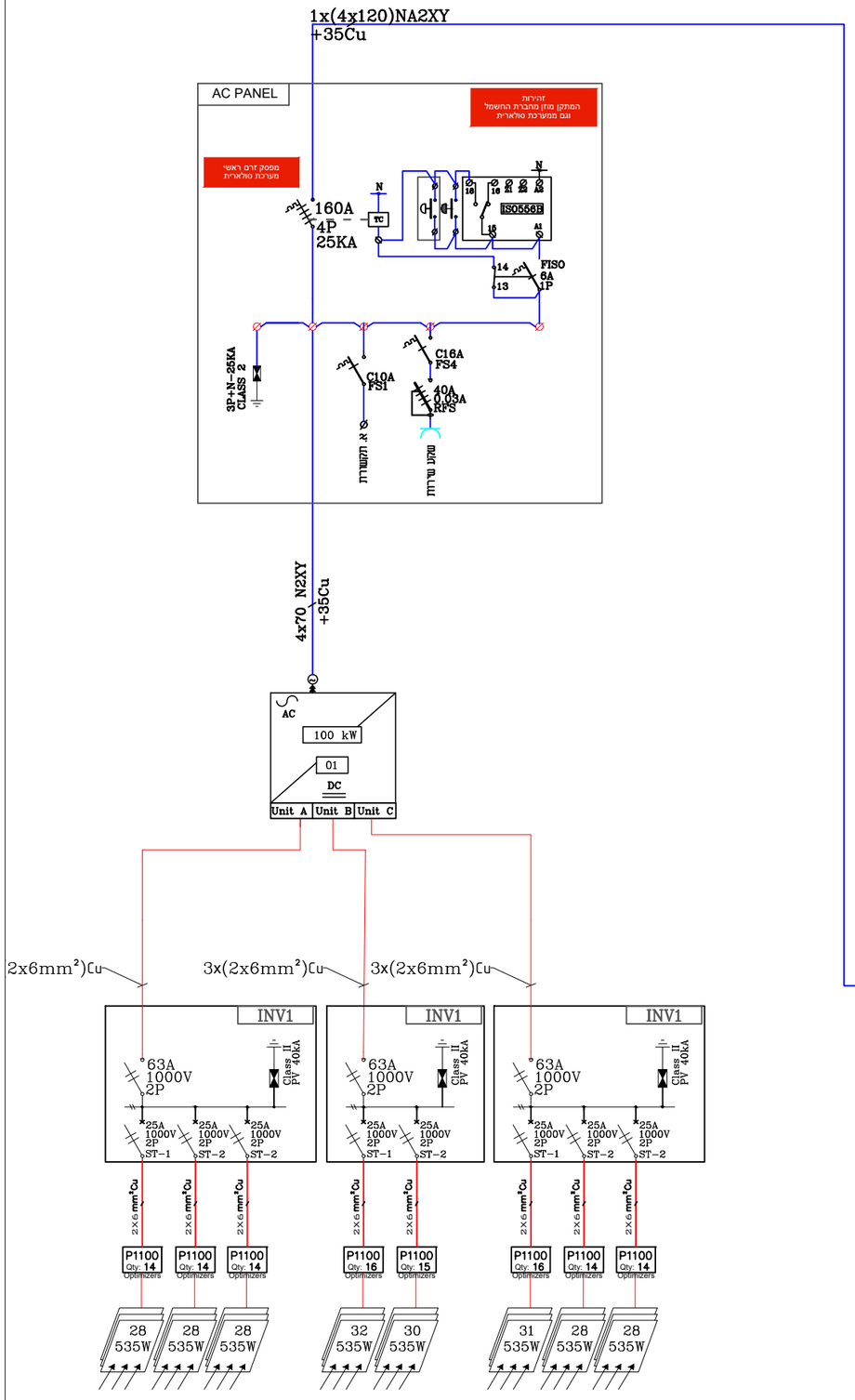


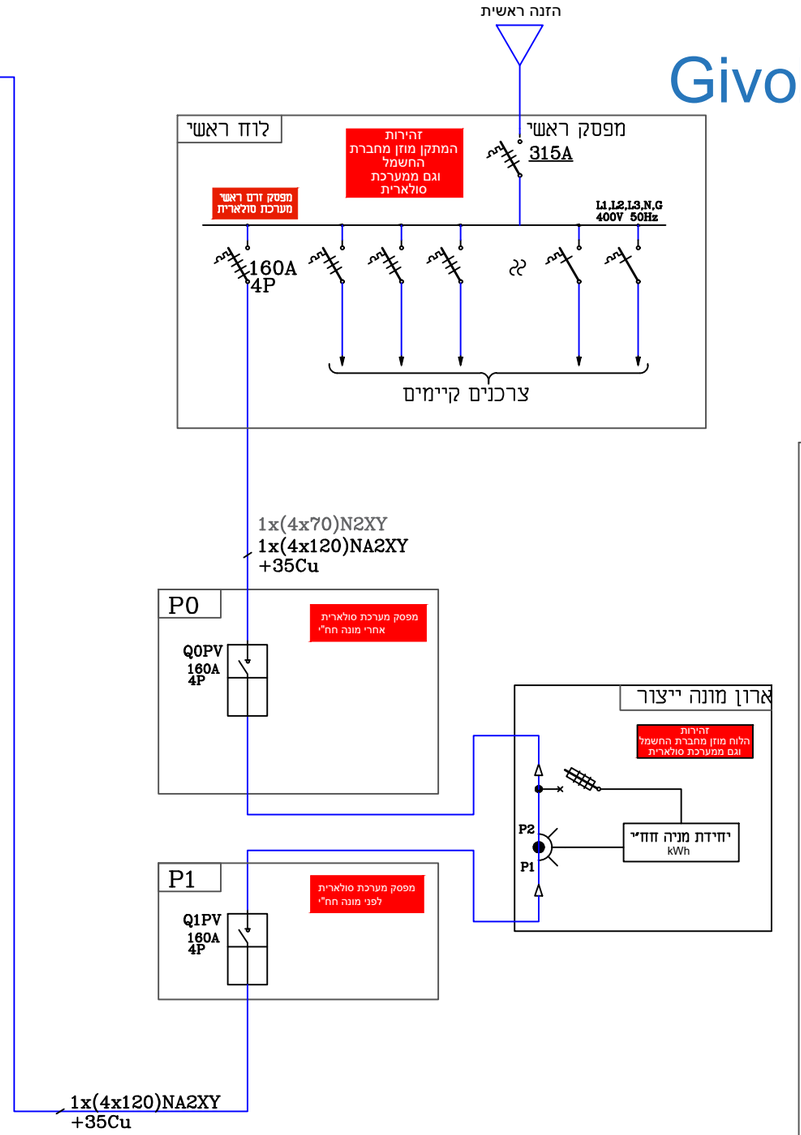
Title: תוכנית חיווט פאנלים		DRAWING NUMBER: Givolim school - G001				REV	DATE	DRAWN	COMMENTS
Client: שחר אנרגיה	Site location: רמת גן	DATE: 14/07/2021	Scale: ####	Print size: A3	Sheet: 1/1	A 1	14/07/21	Roi N.	StringWiring
ENERCITY RENEWABLE ENGINEERING		Designer: Roi Nakash		APPROVAL / STAMP					
		Approved:							
		STATUS: לאישור	REV: A 1						

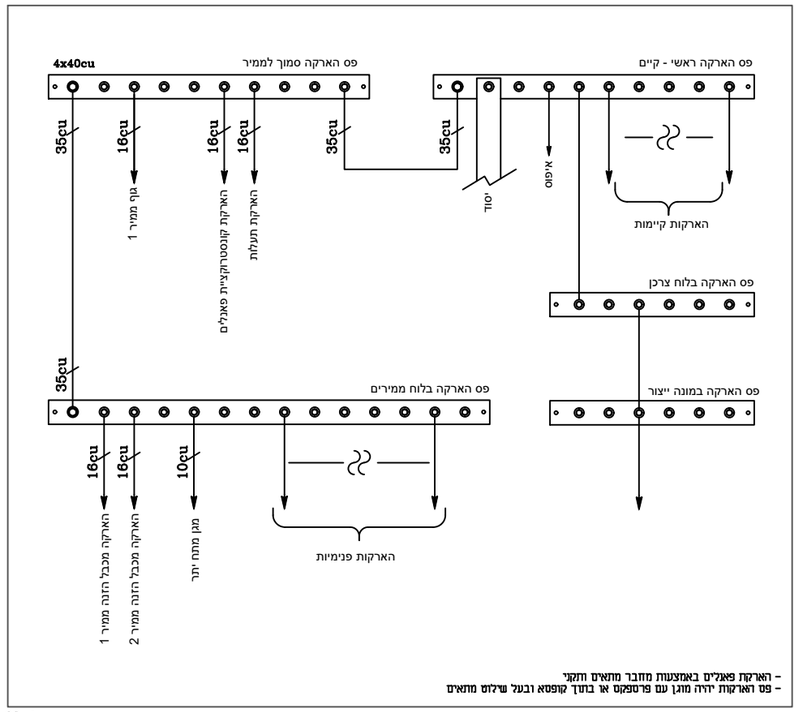
Panels		Inverters		Quant'
Manuf:'	Chint [2256x1133x35]	Manuf:'	Solar Edge	
Model:	535W	Model A:	50kW	2
Quant:'	233	Model B:		
Tilt:	18°\15°	Model C:		
Azimuth:	168°	Model D:		
T.Power:	124.655kW	T.Power:	100kW	

Givolim StringWiring









Notes:
1. Elec. panel should be compatible with IL elec. norm 61439
2. Cables, cores, ducts and modules should be marked with proper marking
3. Live elec. contacts must be insulated

בית ספר גבעולים, רמת גן - חלוקה לסטרינגים/ממירים

הספק פאנל בודד(W)	535
מ"ס פאנלים כללי :	233
הספק כללי AC (KW) :	100
הספק כללי DC (KW) :	124.655
יחס AC/DC :	124.66%

גג	ממיר	סוג ממיר (kW)	כניסת mppt	מ"ס סטרינגים	אופטימייזרים P1100	מ"ס פאנלים	הספק DC (kW)	הספק AC (kW)	AC/DC
בטון	1	SE 100kW	Right	3	16	31	124.655	100	124.66%
					14	28			
			Center	2	14	28			
					16	32			
					15	30			
			Left	3	14	28			
					14	28			
					14	28			
סה"כ כמות:					117	233	124.655	100	124.66%

Title:	תוכנית חיווט פאנלים	DRAWING NUMBER:	Givolim school - G001
Client:	שחר אנרגיה	Site location:	רמת גן
DATE:	14/07/2021	Scale:	####
Print size:	A3	Sheet :	1/1
Designer:	Roi Nakash	APPROVAL / STAMP	
Approved:			
STATUS :	לאישור	REV:	A 1

ENERCITY RENEWABLE ENGINEERING

REV	DATE	DRAWN	COMMENTS
A 1	14/07/21	Roi N.	StringWiring

Panels		Inverters		Quant'
Manuf: '	Chint [2256x1133x35]	Manuf: '	Solar Edge	
Model:	535W	Model A:	50kW	2
Quant: '	233	Model B:		
Tilt:	18°\15°	Model C:		
Azimuth:	168°	Model D:		
T.Power:	124.655kW	T.Power:	100kW	

Version 7.1.8

PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Gan_Givolim

Variant: 18/15 Deg

Sheds on a building

System power: 123 kWp

Ramat Gan - Israel

Author

Green Panel (Israel)

PVsyst V7.1.8
VC4, Simulation date:
10/08/21 13:34
with v7.1.8

Project summary

Geographical Site
Ramat Gan
Israel

Situation

Latitude	32.08 °N
Longitude	34.81 °E
Altitude	46 m
Time zone	UTC+2

Project settings
Albedo 0.20

Meteo data
Ramat Gan
Meteonorm 7.3 (1990-2004), Sat=100% - Synthetic

System summary

Grid-Connected System

Sheds on a building

PV Field Orientation

Fixed planes	2 orientations
Tilts/azimuths	18 / -13 °
	15 / -14 °

Near Shadings

According to strings	
Electrical effect	100 %

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	230 units
Pnom total	123 kWp

Inverters

Nb. of units	3 units
Pnom total	99.9 kWac
Grid power limit	100 kWac
Grid lim. Pnom ratio	1.231

Results summary

Produced Energy	206.8 MWh/year	Specific production	1681 kWh/kWp/year	Perf. Ratio PR	76.85 %

Table of contents

PVsyst V7.1.8
VC4, Simulation date:
10/08/21 13:34
with v7.1.8

General parameters

Grid-Connected System

Sheds on a building

PV Field Orientation

Orientation	
Fixed planes	2 orientations
Tilts/azimuths	18 / -13 ° 15 / -14 °

Sheds configuration	
Nb. of sheds	24 units
Sizes	
Sheds spacing	3.01 m
Collector width	3.88 m
Ground Cov. Ratio (GCR)	128.8 %
Shading limit angle	
Limit profile angle	119.5 °

Models used	
Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon
Free Horizon

Near Shadings
According to strings
Electrical effect 100 %

User's needs
Unlimited load (grid)

Grid power limitation

Active Power	100 kWac
Pnom ratio	1.231

PV Array Characteristics

PV module

Manufacturer	Longi Solar
Model	LR5-72 HPH 535 M
(Original PVsyst database)	
Unit Nom. Power	535 Wp
Number of PV modules	230 units
Nominal (STC)	123 kWp

Inverter

Manufacturer	SolarEdge
Model	SE66.6K/SE100K-EU-APAC/AUS Unit (400V)
(Original PVsyst database)	
Unit Nom. Power	33.3 kWac
Number of inverters	3 units
Total power	99.9 kWac

SolarEdge Power Optimizer

Model	P1100 Worldwide
Unit Nom. Power	1100 W
Modules	1 String x 2 in series

Array #1 - PV Array

Orientation	#1		
Tilt/Azimuth	18/-13 °		
Number of PV modules	140 units	Number of inverters	1.8 units
Nominal (STC)	74.9 kWp	Total power	60.8 kWac
Optimizer Array	5 Strings x 14 In series		
At operating cond. (50°C)		Operating voltage	750 V
Pmpp	68.5 kWp	Pnom ratio (DC:AC)	1.16
Output of optimizers			
Voper	750 V		
I at Poper	91 A		

Array #2 - Sub-array #2

Orientation	#2		
Tilt/Azimuth	15/-14 °		
Number of PV modules	90 units	Number of inverters	1.2 Unit
Nominal (STC)	48.2 kWp	Total power	39.1 kWac
Optimizer Array	3 Strings x 15 In series		
At operating cond. (50°C)		Operating voltage	750 V
Pmpp	44.0 kWp	Pnom ratio (DC:AC)	1.15
Output of optimizers			
Voper	750 V		
I at Poper	59 A		

PVsyst V7.1.8
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PV Array Characteristics

Total PV power		**Total inverter power**	
Nominal (STC)	123 kWp	Total power	100 kWac
Total	230 modules	Nb. of inverters	3 units
Module area	588 m²	Pnom ratio	1.23
Cell area	533 m²		

PVsyst V7.1.8
VC4, Simulation date:
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Array losses

Array Soiling Losses
Loss Fraction 3.0 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 25.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation
Loss Fraction 2.0 %

Module Quality Loss
Loss Fraction 0.0 %

Module mismatch losses
Loss Fraction (Fixed voltage) 0.0 %

Strings Mismatch loss
Loss Fraction 0.1 %

IAM loss factor
ASHRAE Param: IAM = 1 - bo(1/cosi -1)
bo Param. 0.05

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array
Global array res. 112 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2
Global array res. 175 mΩ
Loss Fraction 1.5 % at STC

System losses

Unavailability of the system
Time fraction 3.0 %
10.9 days,
3 periods

AC wiring losses

Inv. output line up to injection point
Inverter voltage 400 Vac tri
Loss Fraction 1.5 % at STC

Global System
Wire section Alu 3 x 185 mm²
Wires length 117 m

PVsyst V7.1.8
VC4, Simulation date:
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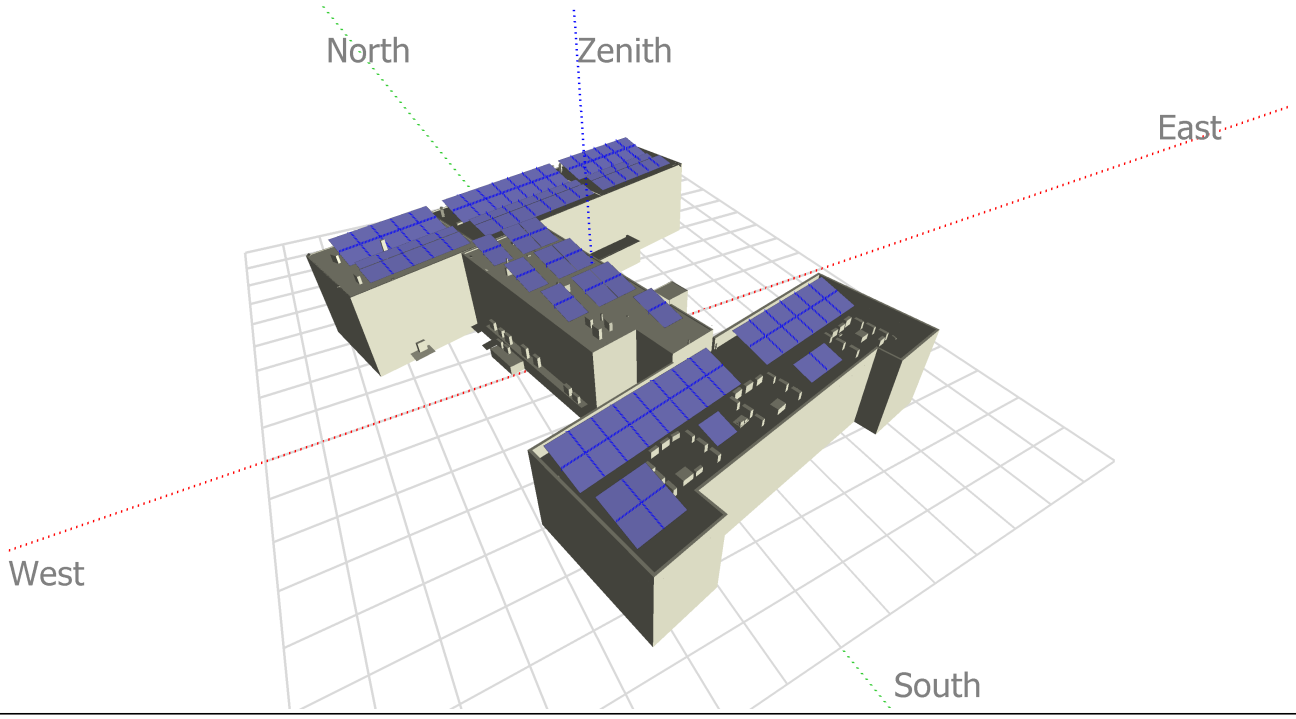
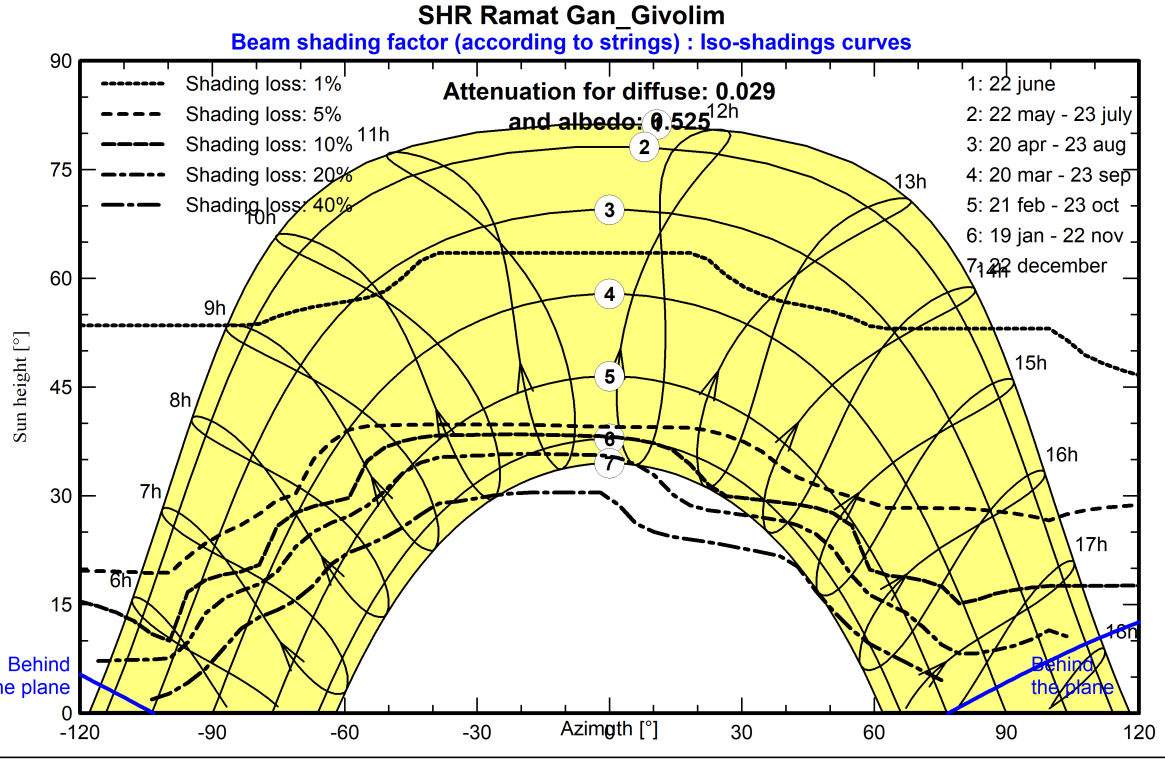
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

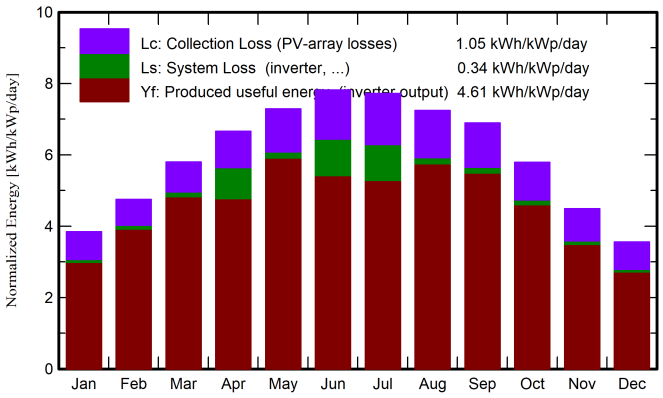


Main results

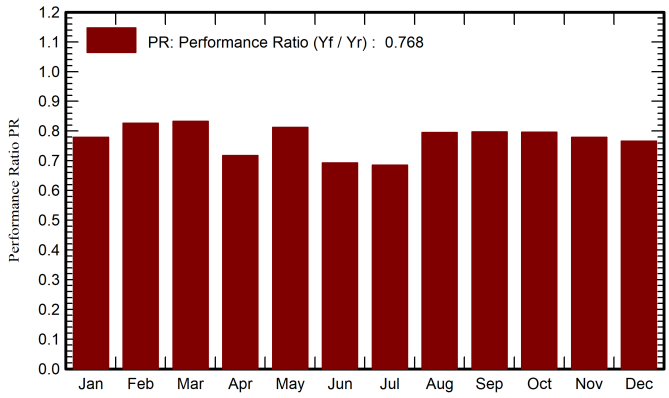
System Production

Produced Energy	206.8 MWh/year	Specific production	1681 kWh/kWp/year
		Performance Ratio PR	76.85 %

Normalized productions (per installed kWp)



Performance Ratio PR



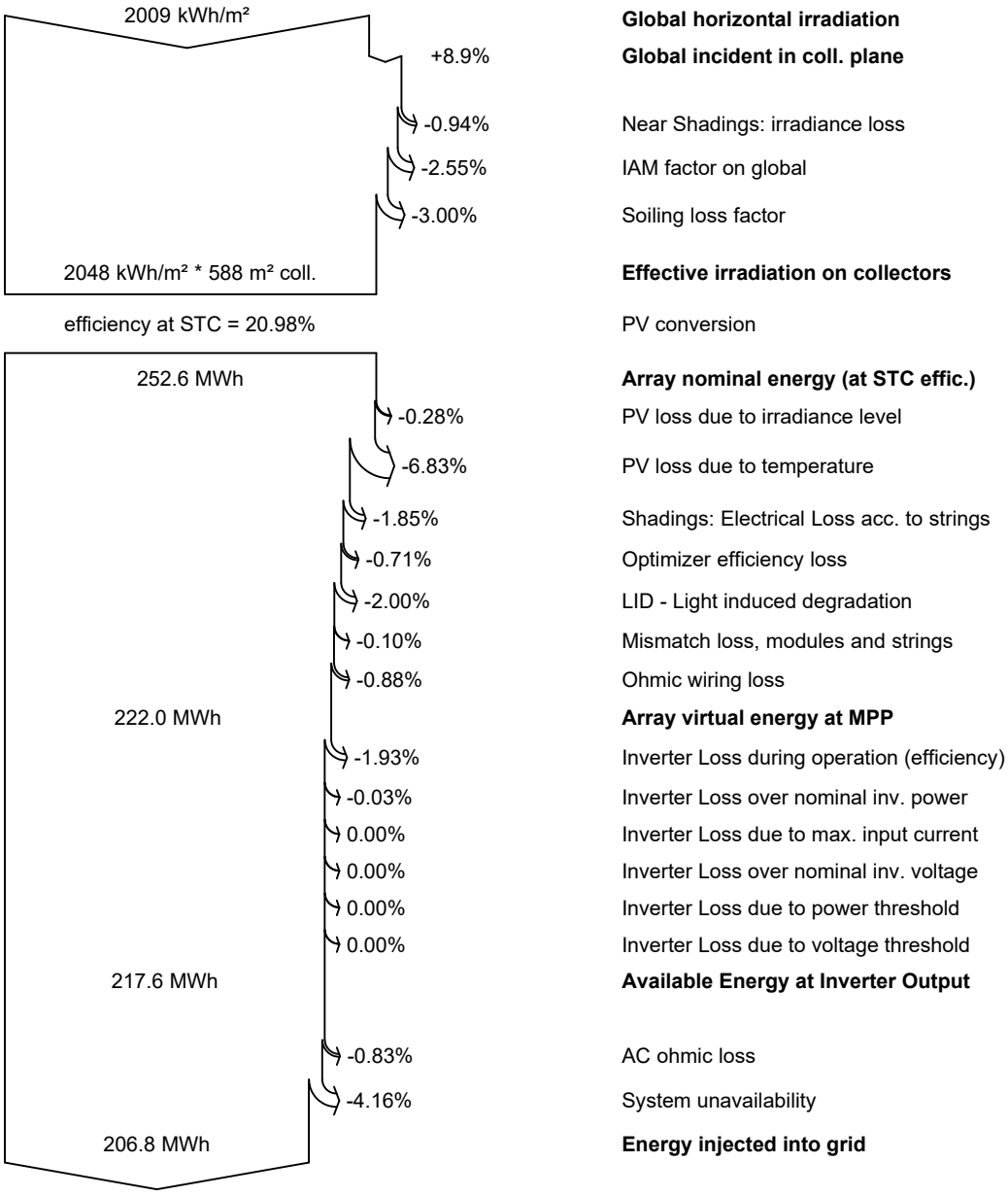
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	92.1	38.65	12.89	119.2	109.5	11.72	11.42	0.779
February	110.6	46.40	13.53	133.1	124.0	13.90	13.53	0.826
March	159.8	62.31	16.27	179.9	169.0	18.95	18.42	0.832
April	190.0	71.96	19.23	199.8	188.0	20.85	17.63	0.717
May	226.6	76.41	22.47	226.0	212.4	23.23	22.57	0.812
June	241.9	59.07	25.29	234.6	220.6	23.79	20.01	0.693
July	243.9	61.59	28.17	239.3	224.9	24.00	20.17	0.685
August	218.1	66.52	28.42	224.5	211.5	22.60	21.95	0.795
September	186.5	47.52	26.35	206.7	194.7	20.87	20.27	0.797
October	149.4	46.27	23.76	179.4	167.9	18.07	17.58	0.796
November	105.1	34.92	18.84	134.6	124.9	13.27	12.91	0.779
December	84.7	38.69	15.00	110.2	100.9	10.64	10.38	0.765
Year	2008.7	650.32	20.90	2187.3	2048.1	221.89	206.83	0.768

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

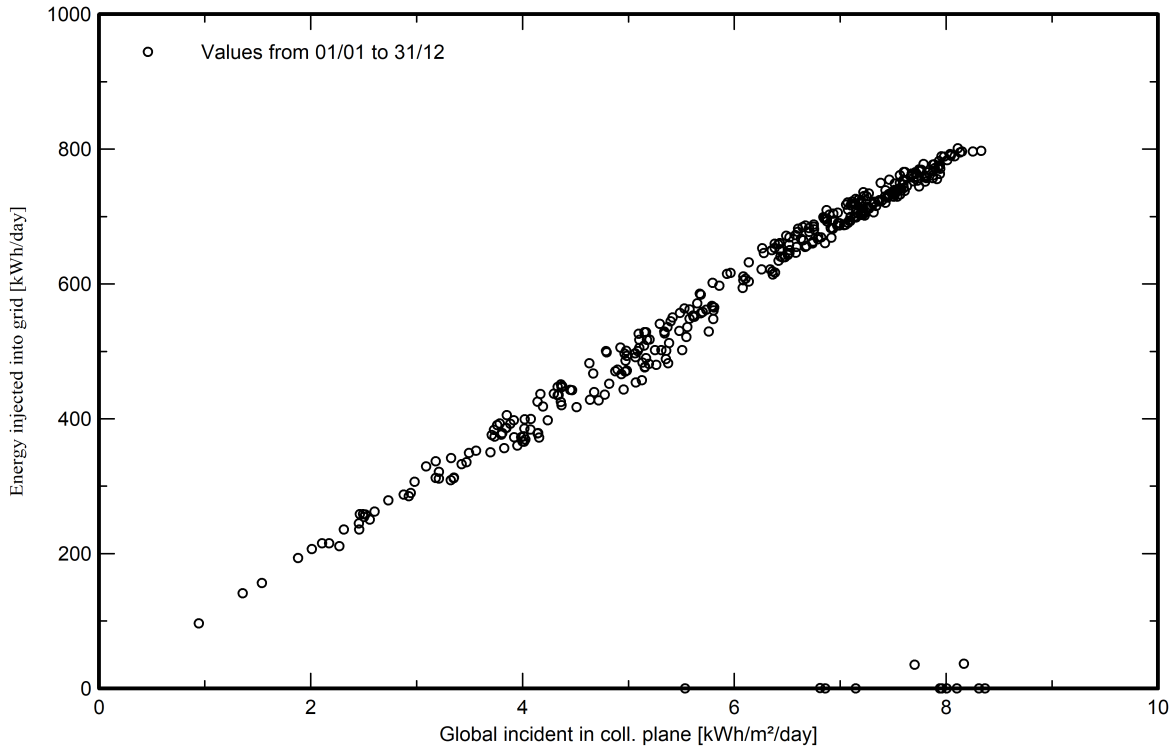
Loss diagram



PVsyst V7.1.8
VC4, Simulation date:
10/08/21 13:34
with v7.1.8

Special graphs

Daily Input/Output diagram



System Output Power Distribution