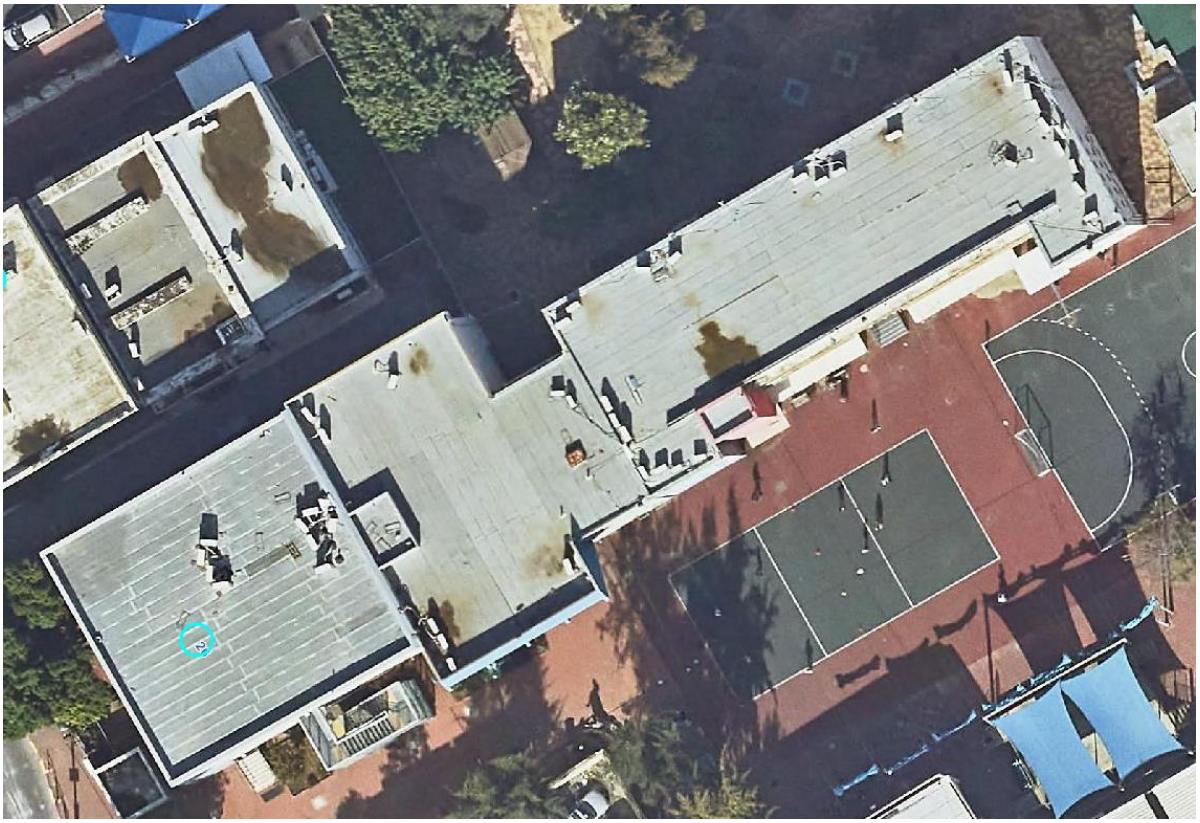
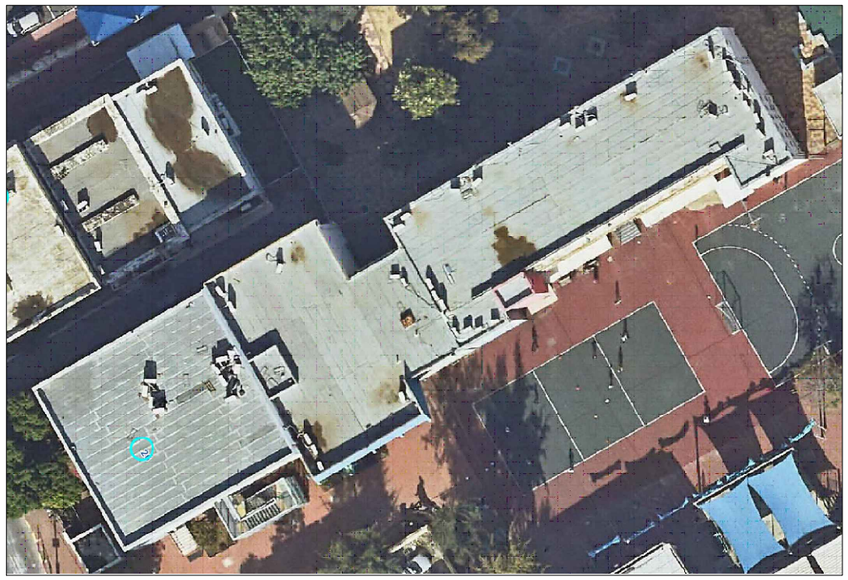
שחר אנרגיה - בית ספר נטעים
מערכת סולארית מתח נמוך – 117.165kW

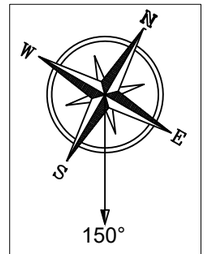


רשימת תוכניות:

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

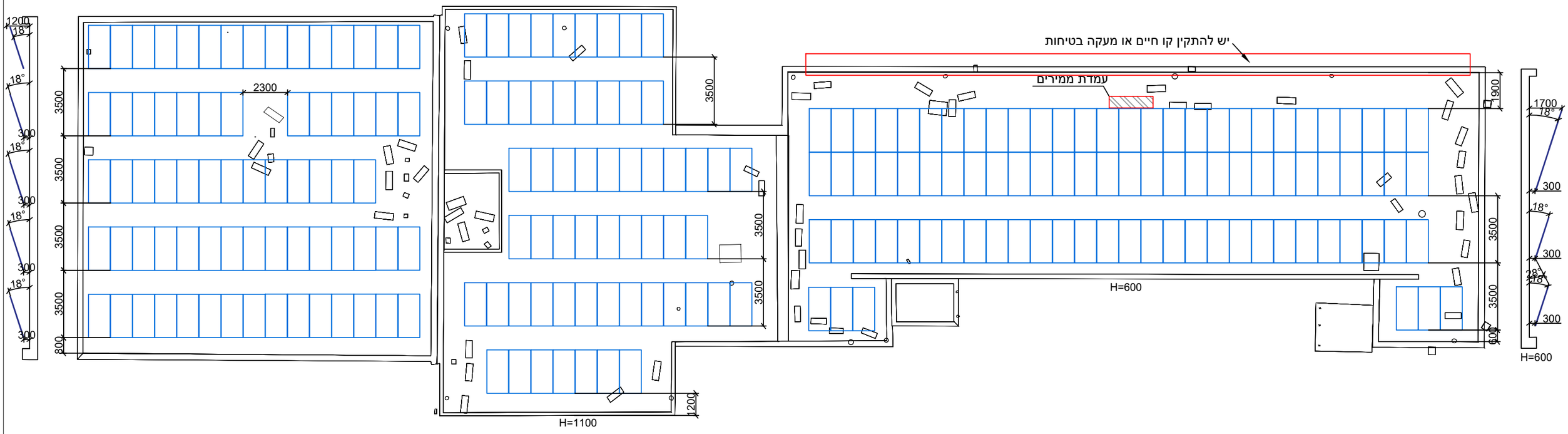


חלוקה לסטרינגים וממירים - נטעים										
									הספק פאנל [W]:	535
									כמות פאנלים:	219
									הספק AC[kW]:	90.0 kW
									הספק DC[kWp]:	117.165 kWp
									חס העמסה AC/DC:	130.18%
סוג	מס' ממיר	סוג ממיר	מס' סטרינגים	אופטימייזר	מס' פאנלים	הספק DC[kWp]	הספק AC[kW]	AC/DC (%)
בטון	1	SolarEdge 50kW [45 kW]	2	A	28	58.9 kWp	45.0 kW	130.78%
					28			
			2	B	27			
					27			
	2	SolarEdge 50kW [45 kW]	2	A	28	58.3 kWp	45.0 kW	129.59%
					27			
			2	B	27			
					27			
			8		112	117.165 kWp	90.0 kW	130.18%



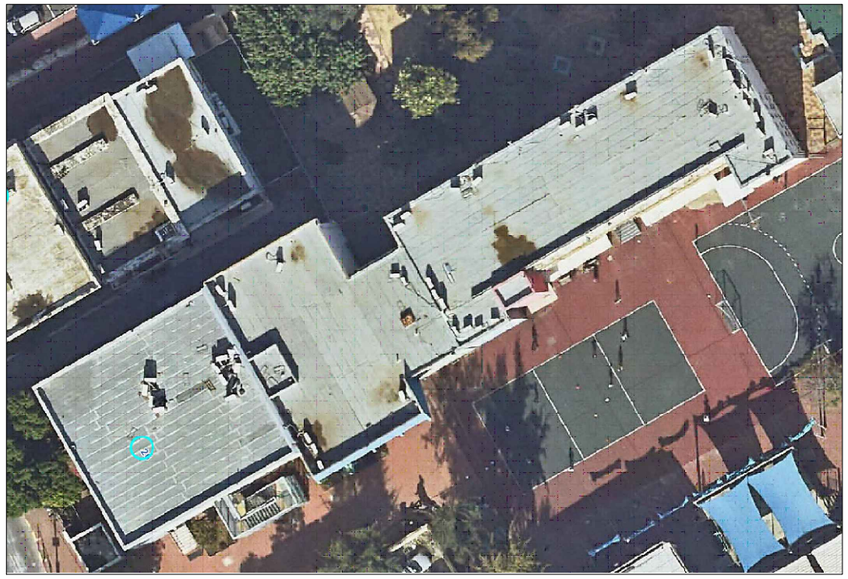
ביצוע כל עבודה בכפוף להוראות ממונה הבטיחות

Netaim Design Layout



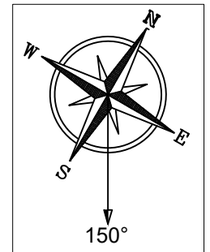
Title:	תוכנית הצבת פאנלים	DRAWING NUMBER:	Netaim school - G001	REV	DATE	DRAWN	COMMENTS	Panels		Inverters	Quant'
Client:	שחר אנרגיה	Site location:	רמת גן	A 1	20/06/21	Roi N.	Layout Update	Manuf:'	Chint [2256x1133x35]	Manuf:'	Solar Edge	
DATE:	24/02/2021	Scale:	####					Model:	535W	Model A:	50kW [45kW]	2
Print size:	A3	Sheet :	1/1					Quant:'	219	Model B:		
Designer:	Roi Nakash							Tilt:	18°	Model C:		
Approved:								Azimuth:	150°	Model D:		
STATUS :	לאישור	REV:	A 1					T.Power:	117.165kW	T.Power:	90kW	
APPROVAL / STAMP												

ENERCITY RENEWABLE ENGINEERING



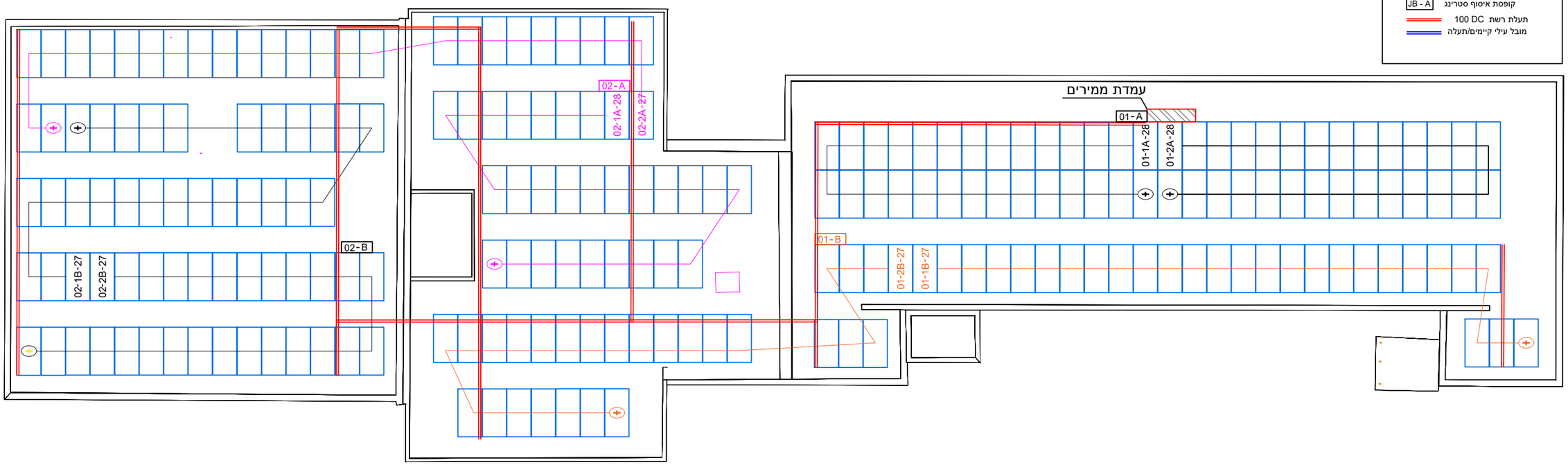
חלוקה לסטרינגים וממירים - נטעים										
סוג	מס' ממיר	סוג ממיר	Unit	מס' סטרינגים	אופטימייזר P1100	מס' פאנלים	הספק DC[kWp]	הספק AC[kW]	AC/DC (%)
בטון	1	SolarEdge 50kW [45 kW]	A	2	14	28	58.9 kWp	45.0 kW	130.78%
					14	28			
			B	2	14	27			
					14	27			
	2	SolarEdge 50kW [45 kW]	A	2	14	28	58.3 kWp	45.0 kW	129.59%
					14	27			
			B	2	14	27			
					14	27			
				8	112	219	117.165 kWp	90.0 kW	130.18%

הספק פאנל [W]:	535
כמות פאנלים:	219
הספק AC[kW]:	90.0 kW
הספק DC[kWp]:	117.165 kWp
חס העמסה AC/DC:	130.18%



ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות

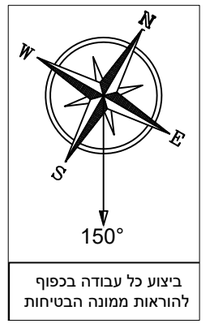
Netaim -String Wiring

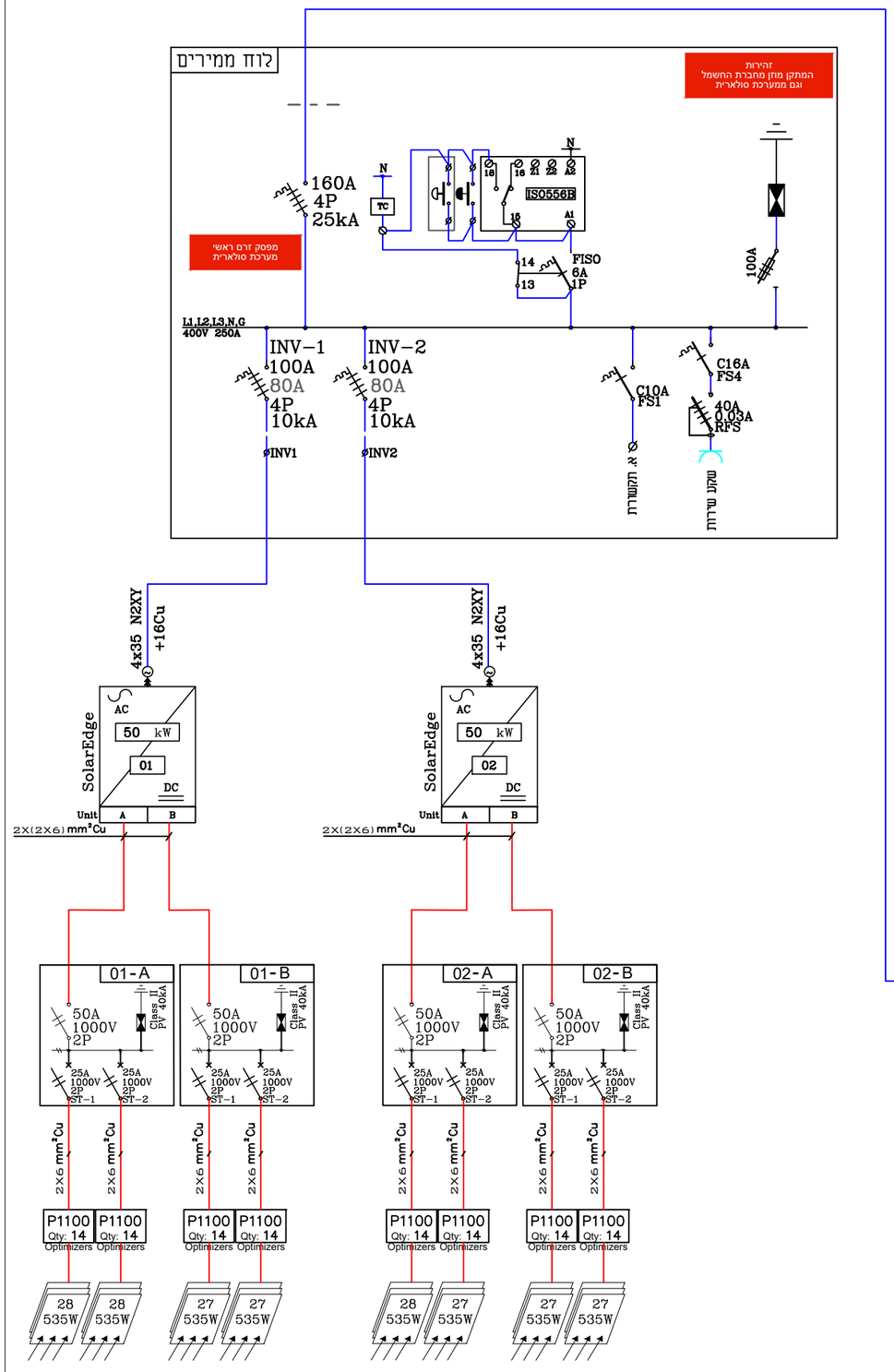


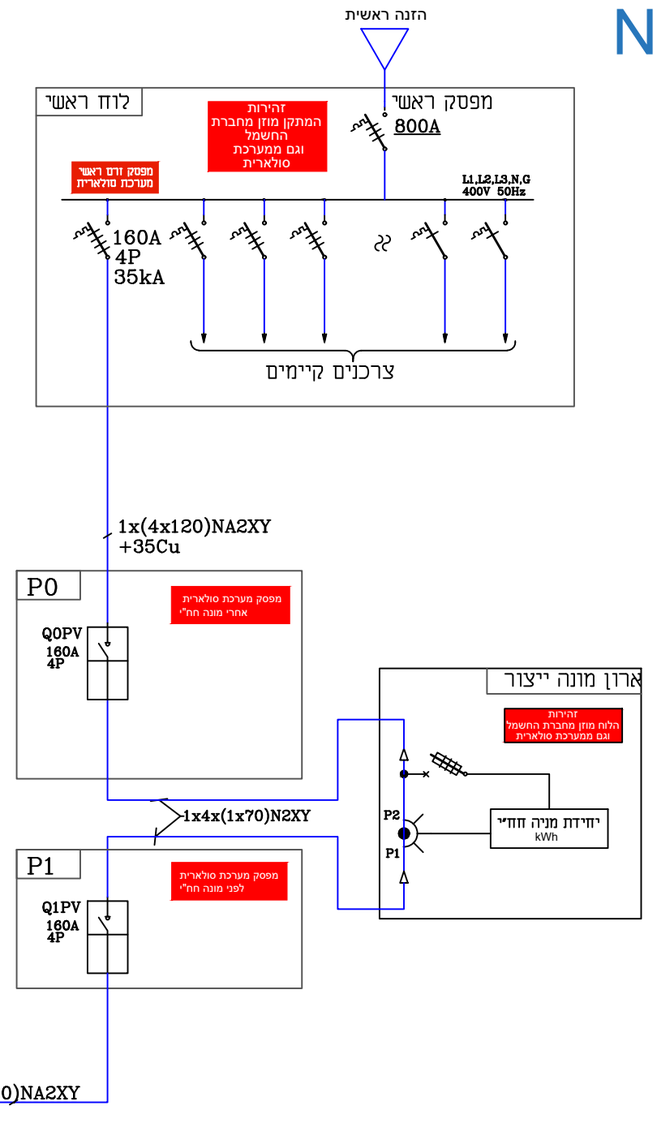
Title:	תוכנית חיווט פאנלים		DRAWING NUMBER:	Netaim school - G001			REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client:	שחר אנרגיה	Site location: רמת גן	DATE:	Scale:	Print size:	Sheet :	A 1	20/06/21	Roi N.	String Wiring	Manuf:'	Chint [2256x1133x35]	Manuf:'	Solar Edge	
			24/02/2021	####	A3	1/1					Model:	535W	Model A:	50kW [45kW]	2
			Designer:	Roi Nakash		APPROVAL / STAMP					Quant:'	219	Model B:		
			Approved:								Tilt:	18°	Model C:		
			STATUS :	REV:							Azimuth:	150°	Model D:		
			לאישור	A 1							T.Power:	117.165kW	T.Power:	90kW	

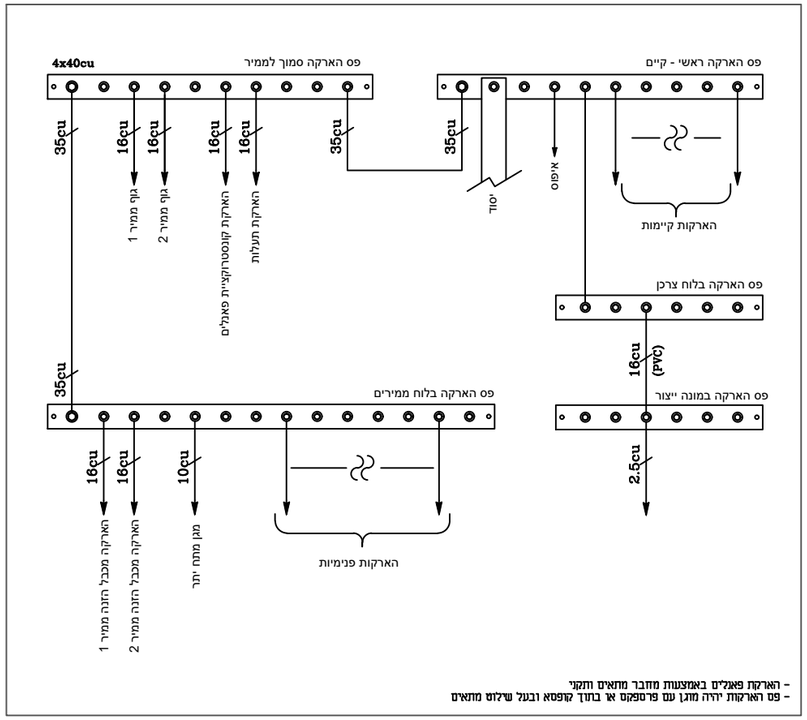
ENERCITY
RENEWABLE ENGINEERING

Netaim Single Line









חלוקה לסטרינגים וממירים - נטעים										
סוג	מס' ממיר	סוג ממיר	Unit	מס' סטרינגים	אופטימייזר P1100	מס' פאנלים	הספק [kWp]DC	הספק [kW]AC	AC/DC (%)
בטון	1	SolarEdge 50kW [45 kW]	A	2	14	28	58.9 kWp	45.0 kW	130.78%
					14	28			
			B	2	14	27			
					14	27			
	2	SolarEdge 50kW [45 kW]	A	2	14	28	58.3 kWp	45.0 kW	129.59%
					14	27			
			B	2	14	27			
					14	27			
				8	112	219	117.165 kWp	90.0 kW	130.18%

הספק פאנל [W]:	535
כמות פאנלים:	219
הספק AC[kW]:	90.0 kW
הספק DC[kWp]:	117.165 kWp
חס העמסה AC/DC:	130.18%

Title:	תוכנית הצבת פאנלים	DRAWING NUMBER:	Netaim school - G001
Client:	שחר אנרגיה	Site location:	רמת גן
DATE:	24/02/2021	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	20/06/21	Roi N.	SLD Drawing

Panels		Inverters		Quant'
Manuf.:	Chint [2256x1133x35]	Manuf.:	Solar Edge	
Model:	535W	Model A:	50kW [45kW]	2
Quant.:	219	Model B:		
Tilt:	18°	Model C:		
Azimuth:	150°	Model D:		
T.Power:	117.165kW	T.Power:	90kW	

Version 7.1.8

PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Netaim

Variant: New simulation variant

Sheds on a building

System power: 120 kWp

Ramat Gan - Israel

Author

Green Panel (Israel)

PVsyst V7.1.8
VC0, Simulation date:
21/06/21 13:22
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 plane	
Tilt/Azimuth	18 / -30 °

Near Shadings

According to strings	
Electrical effect	100 %

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	224 units
Pnom total	120 kWp

Inverters

Nb. of units	4 units
Pnom total	100 kWac
Grid power limit	90.0 kWac
Grid lim. Pnom ratio	1.332

Results summary

Produced Energy	201.7 MWh/year	Specific production	1683 kWh/kWp/year	Perf. Ratio PR	77.59 %

Table of contents

General parameters

Grid-Connected System

Sheds on a building

PV Field Orientation

Orientation	
Fixed plane	
Tilt/Azimuth	18 / -30 °

Sheds configuration	
Nb. of sheds	37 units
Sizes	
Sheds spacing	3.53 m
Collector width	2.84 m
Ground Cov. Ratio (GCR)	80.6 %
Shading limit angle	
Limit profile angle	46.8 °

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	90.0 kWac
Pnom ratio	1.332

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	224 units
Nominal (STC)	120 kWp
Optimizer Array	8 Strings x 14 In series
At operating cond. (50°C)	
Pmpp	110 kWp
Output of optimizers	
Voper	750 V
I at Poper	146 A

Inverter

Manufacturer	SolarEdge
Model	SE50K/SE75K Unit
(Original PVsyst database)	
Unit Nom. Power	25.0 kWac
Number of inverters	4 units
Total power	100 kWac
Operating voltage	750 V
Pnom ratio (DC:AC)	1.12

SolarEdge Power Optimizer

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

Total PV power

Nominal (STC)	120 kWp
Total	224 modules
Module area	573 m²
Cell area	519 m²

Total inverter power

Total power	100 kWac
Nb. of inverters	4 units
Pnom ratio	1.20

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

DC wiring losses

Global array res.	70 mΩ
Loss Fraction	1.5 % at STC

LID - Light Induced Degradation

Loss Fraction	2.0 %

Module Quality Loss

Loss Fraction	0.0 %

Module mismatch losses

Loss Fraction (Fixed voltage)	0.0 %

Array losses

Strings Mismatch loss
Loss Fraction 0.2 %

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

System losses

Unavailability of the system

Time fraction	2.0 %
	7.3 days,
	3 periods

AC wiring losses

Inv. output line up to injection point

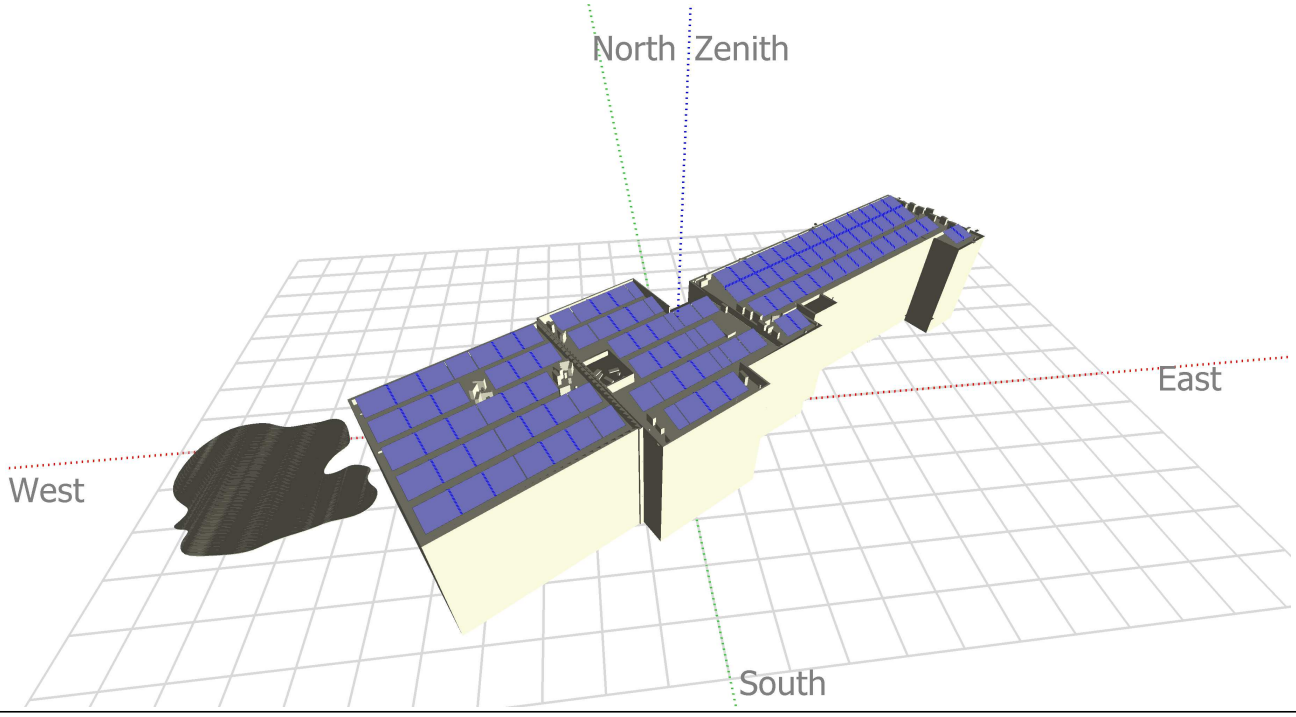
Inverter voltage	400 Vac tri
Loss Fraction	0.5 % at STC

Inverter: SE50K/SE75K Unit

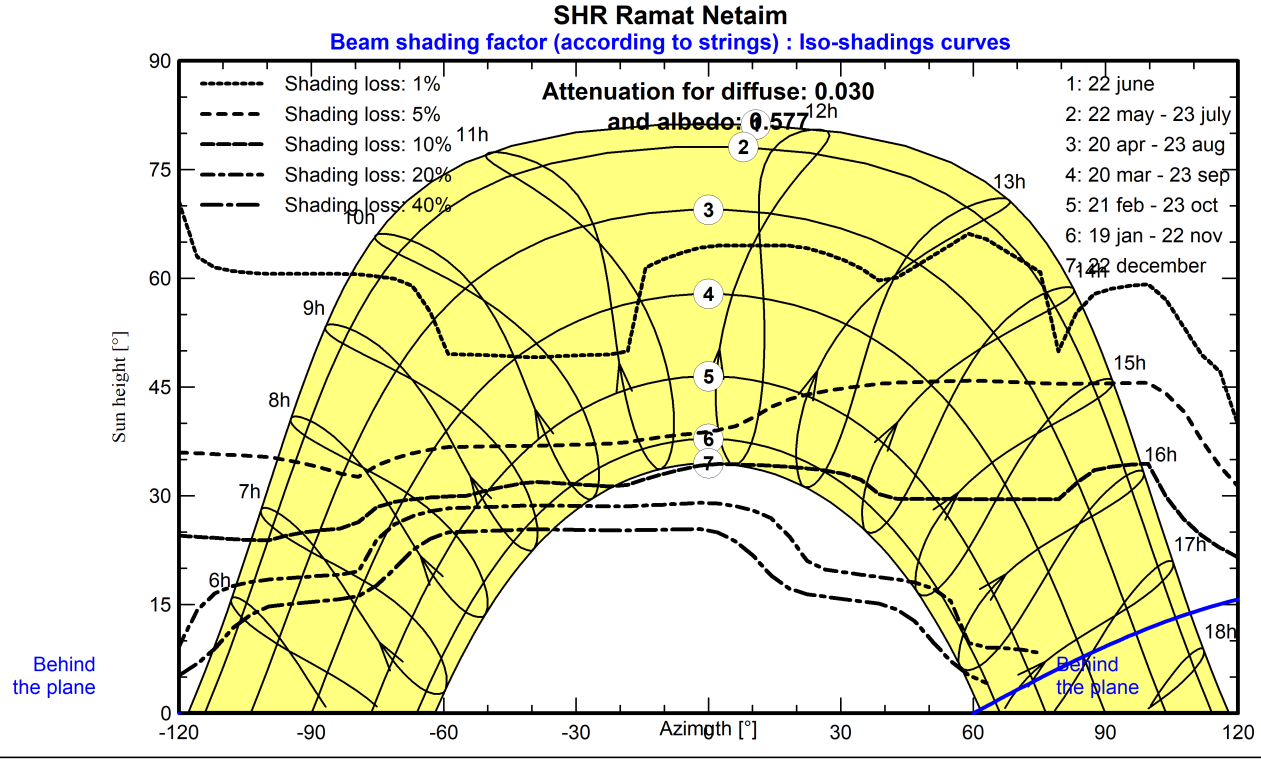
Wire section (4 Inv.)	Alu 4 x 3 x 120 mm²
Average wires length	100 m

Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

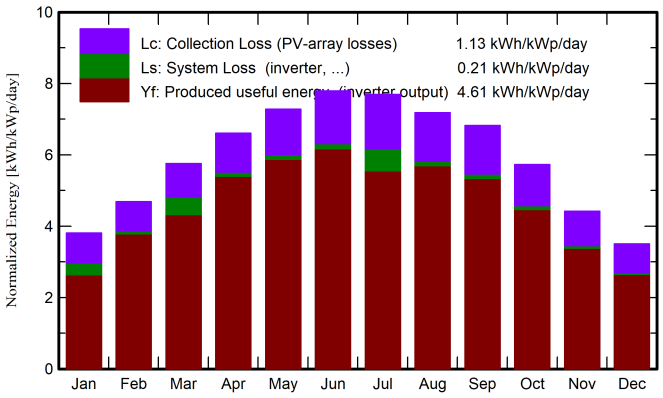


Main results

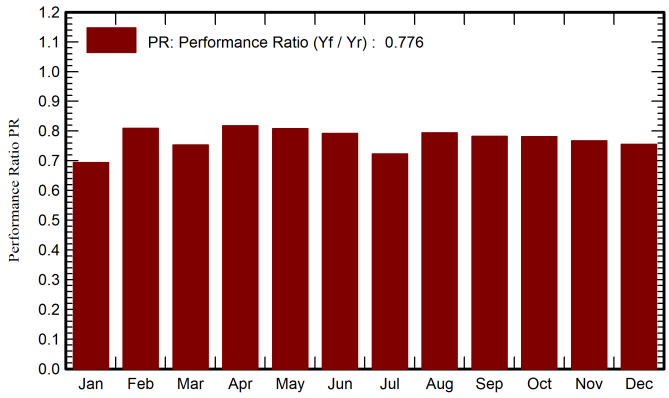
System Production

Produced Energy	201.7 MWh/year	Specific production	1683 kWh/kWp/year
		Performance Ratio PR	77.59 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

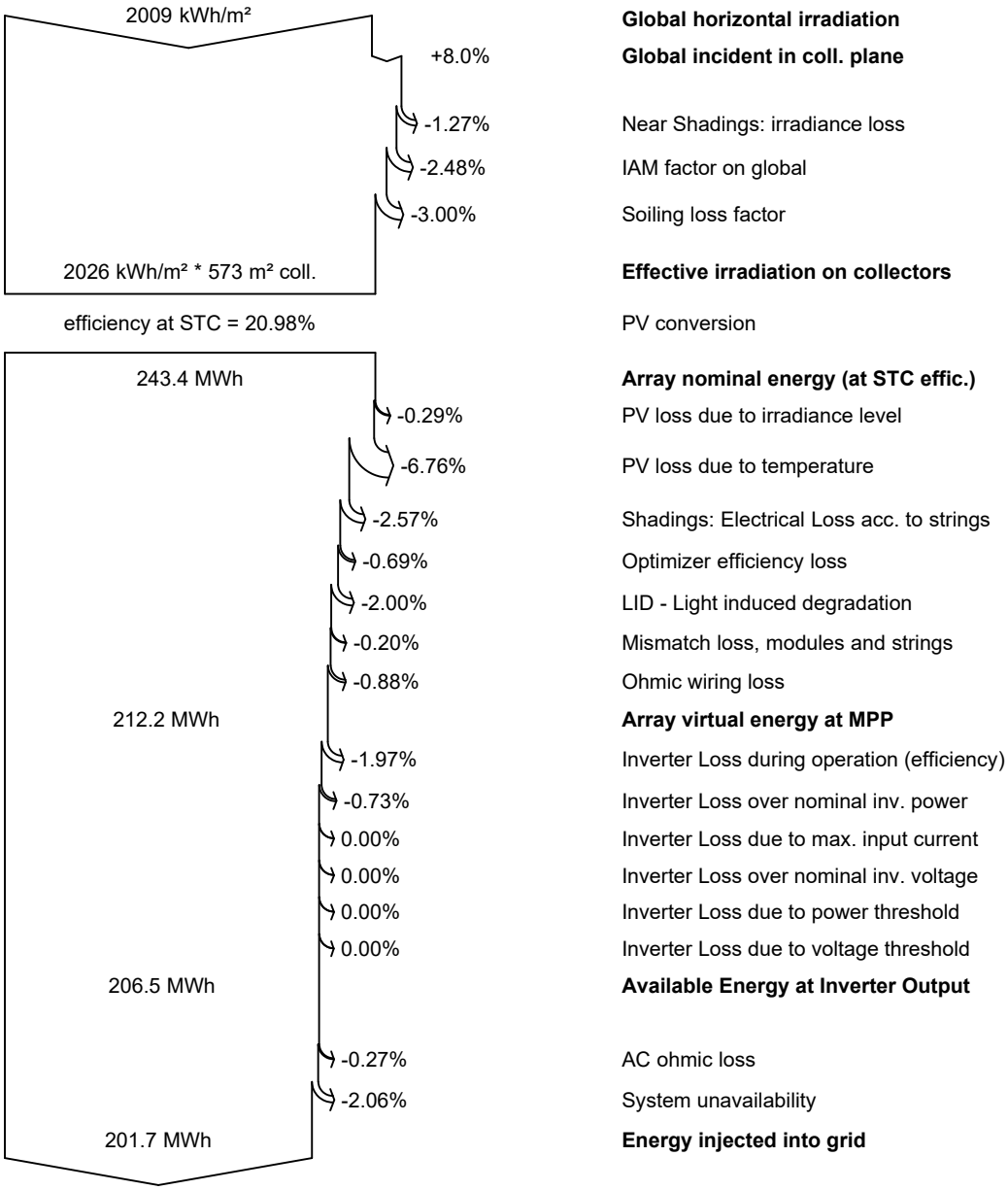
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	92.1	38.65	12.89	118.0	107.4	11.04	9.81	0.694
February	110.6	46.40	13.53	131.2	121.5	13.01	12.72	0.809
March	159.8	62.31	16.27	178.3	166.8	17.94	16.08	0.753
April	190.0	71.96	19.23	198.2	186.2	19.87	19.42	0.818
May	226.6	76.41	22.47	225.6	212.1	22.35	21.84	0.808
June	241.9	59.07	25.29	233.8	220.1	22.71	22.20	0.792
July	243.9	61.59	28.17	238.5	224.3	22.98	20.66	0.723
August	218.1	66.52	28.42	222.6	209.9	21.67	21.18	0.794
September	186.5	47.52	26.35	204.7	192.1	19.64	19.20	0.783
October	149.4	46.27	23.76	177.5	165.0	17.00	16.62	0.781
November	105.1	34.92	18.84	132.4	122.1	12.45	12.17	0.767
December	84.7	38.69	15.00	108.7	98.7	10.06	9.83	0.755
Year	2008.7	650.32	20.90	2169.5	2026.3	210.73	201.73	0.776

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

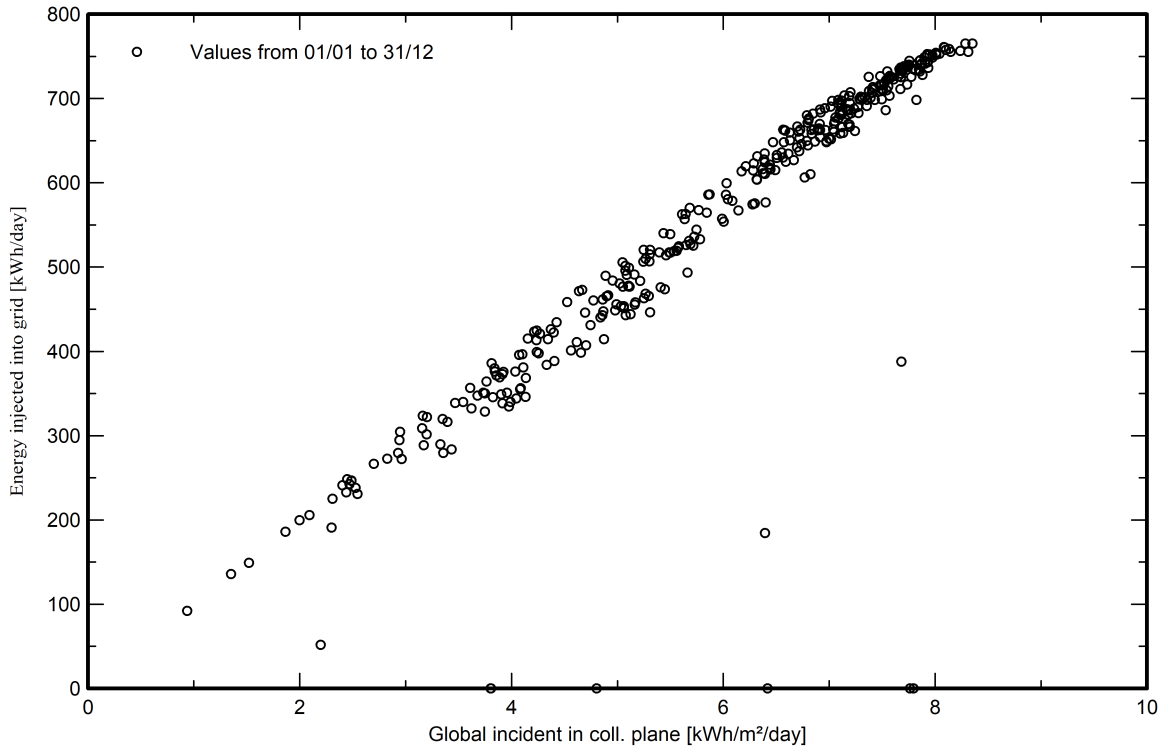
PVsyst V7.1.8
VC0, Simulation date:
21/06/21 13:22
with v7.1.8

Loss diagram

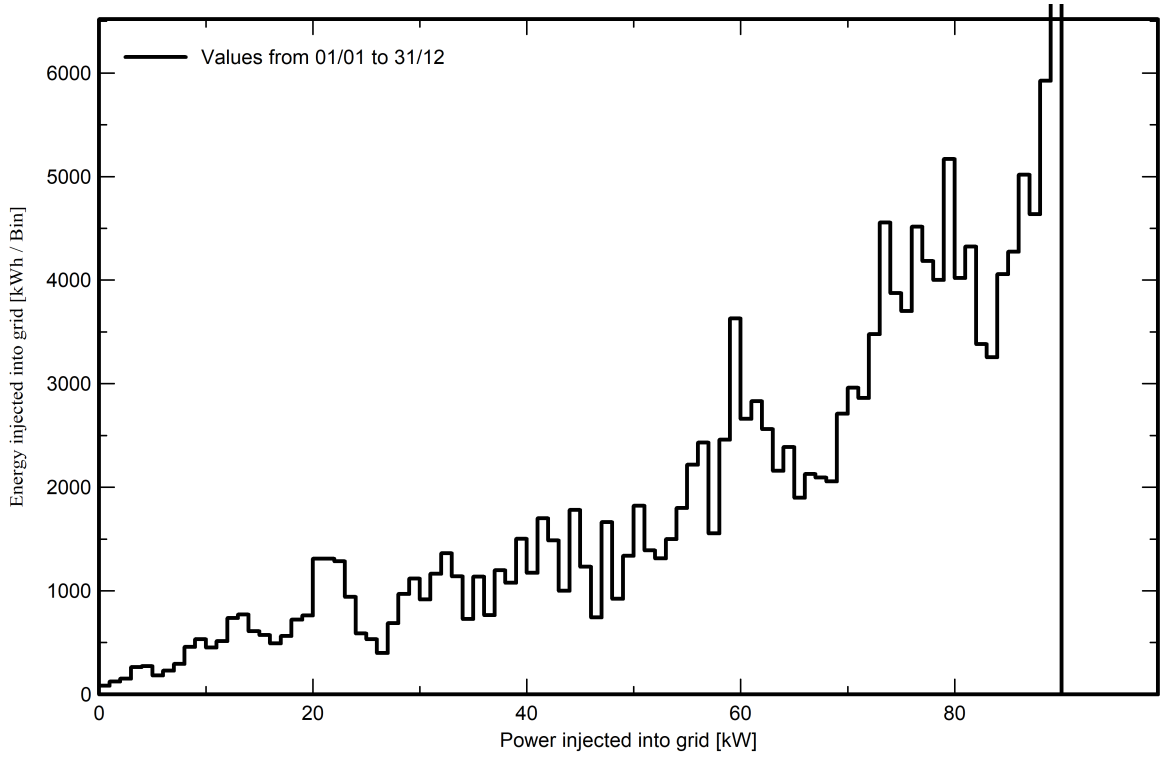


Special graphs

Daily Input/Output diagram



System Output Power Distribution



DC CABLE CALCULATION & POWER LOSSES

DATA	
Module Type	535
Imp [A]	12.86
Vmp [V]	41.60
Module amount	219
Total Power [kWp]	117,165

Cable Calculation										
		Copper			Aluminum					
mm^2		4	6	16	25	35	50	95	120	240
Length		0	608	0	0	0	0	0	0	0

Production Losses	
Grid Load	100%
Power Losses	0.61%
	710W

Inverter	Module No'	Module No' Inv/String	Parallel Strings	Power [W]	Current [A]	Max Current Carrying Capacity [A]	Resistance [Ω/1000m]	No' Cable Sets	Cross section [mm^2]	Cable Lengh [M]	Voltage Drop [V]	Power losses [W]	ΔP %	
01-A	56	56	2	29960	25.72	64.50	3.59	2	6	4	0.4	9	0.03%	DCCB / DCB to INV Losses
ST-1	28	28	1	14980	12.86	36.75	3.59	1	6	35	3	42	0.28%	String Losses
ST-2	28	28	1	14980	12.86	36.75	3.59	1	6	35	3	42	0.28%	
												93	0.31%	Total losses
01-B	54	54	2	28890	25.72	64.50	3.59	2	6	25	2.3	59	0.21%	DCCB / DCB to INV Losses
ST-3	27	27	1	14445	12.86	36.75	3.59	1	6	35	3	42	0.29%	String Losses
ST-4	27	27	1	14445	12.86	36.75	3.59	1	6	40	4	47	0.33%	
												148	0.51%	Total losses
02-A	55	55	2	29425	25.72	64.50	3.59	2	6	50	4.6	119	0.40%	DCCB / DCB to INV Losses
ST-1	27	27	1	14445	12.86	36.75	3.59	1	6	40	4	47	0.33%	String Losses
ST-2	27	27	1	14445	12.86	36.75	3.59	1	6	40	4	47	0.33%	
												214	0.73%	Total losses
02-B	54	54	2	28890	25.72	64.50	3.59	2	6	70	6.5	166	0.58%	DCCB / DCB to INV Losses
ST-3	27	27	1	14445	12.86	36.75	3.59	1	6	40	4	47	0.33%	String Losses
ST-4	27	27	1	14445	12.86	36.75	3.59	1	6	35	3	42	0.29%	
												255	0.88%	Total losses
				117,165	TOTAL							710	0.61%	TOTAL

AC CABLE CALCULATION & POWER LOSSES

בית ספר נטעים

DATA			
Module Type	535	Voltage [V]	400
Imp [A]	12.86	Load [%]	100%
Vmp [V]	41.60	Cos Ph	1
Module amount	219	Total Power [kVA]	90.00
Total Power [kWp]	117,165		

Production Losses	
Avg' Voltage Drop	0.22%
Max Voltage Drop	0.22%
Power Losses	0.22%
	196.28W

FROM	TO	Module amount DC	DC Power [kW]	AC Power [kVA]	MAX AC Current [A]	Cable Length [m]	Cable Type		Cross Section [mm^2]	No' Cable sets	Installation type	K1 Ambient Temp'	K2 No' Cable sets	K3 No' Cables in Conduit	K4 Thermal resistance (W/km)	Max Current Carrying Capacity [A]	R (at cable temp.) [Ω/Km]	Z (impedance) [Ω/Km]	ΔU Cable [V]	Power Losses [W]	ΔU Cable [%]	ΔU AC Line [%]	Power Losses [%]
INV 1	LVP	110	58.9	45.00	64.95	4	4x35 NA2XY	Copper	35	1	Air	0.95	0.88	1	1	94.5	0.555	0.561	0.25	28.1	0.06%	0.22%	0.03%
INV 2	LVP	109	58.3	45.00	64.95	5	4x35 NA2XY	Copper	35	1	Air	0.95	0.88	1	1	94.5	0.555	0.561	0.32	35.1	0.08%	0.23%	0.03%
LVP	IEC Meter	219	117.2	90.00	129.90	10	4x120 NA2XY	Aluminum	120	1	Air	0.95	1	1	1	164.4	0.263	0.275	0.62	133.1	0.15%	**0.15%**	0.06%
AC [kVA]	90.00																			**196.3**	**Toatl Losses**		**0.22%**