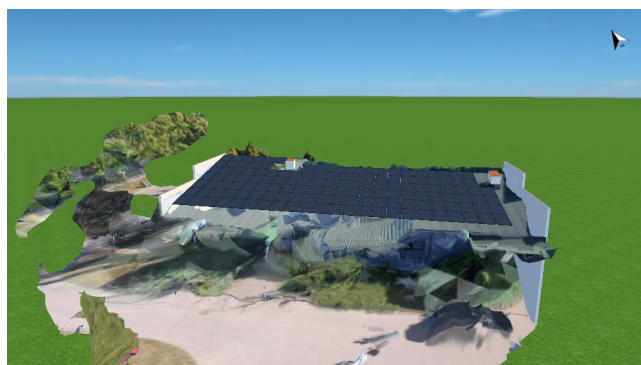


8/4/2023

Your PV system

Address of Installation

Miškininkų g. 7, Vaišvydava
Samylų sen., Kauno r. sav.



Project Overview

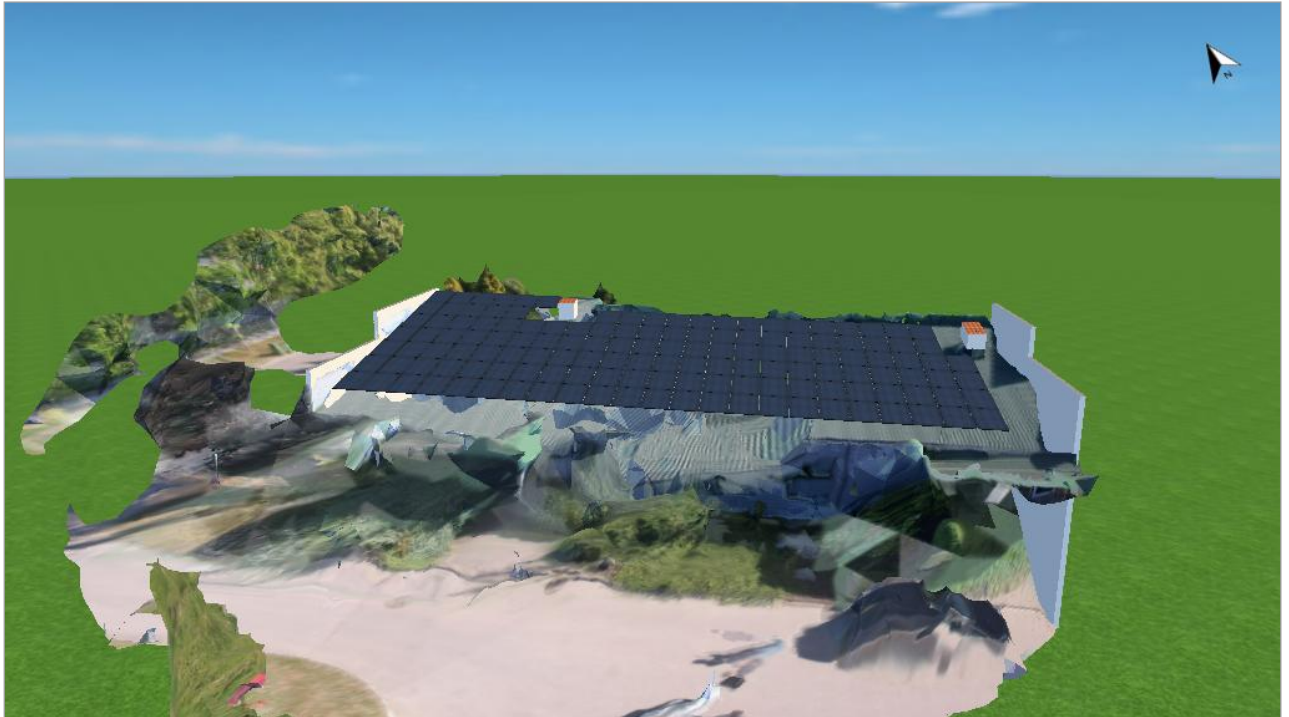


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System

Climate Data	Kaunas, LTU (1996 - 2015)
Values source	Meteonorm 8.1
PV Generator Output	57.68 kWp
PV Generator Surface	271.4 m ²
Number of PV Modules	139
Number of Inverters	1

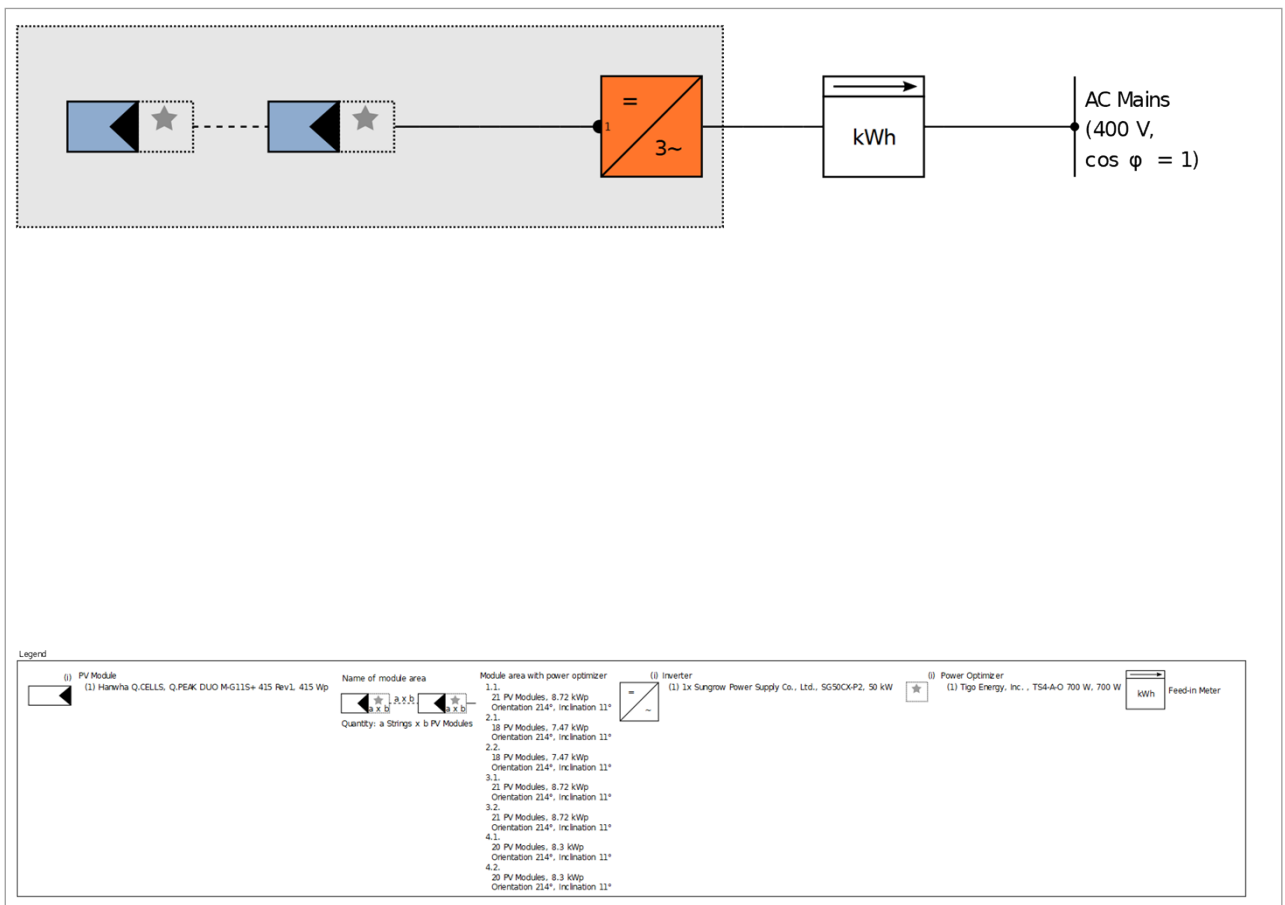


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	57.69 kWp
Spec. Annual Yield	996.24 kWh/kWp
Performance Ratio (PR)	91.10 %
Yield Reduction due to Shading	2.1 %
Grid Export	57,502 kWh/Year
Grid Export in the first year (incl. module degradation)	57,502 kWh/Year
Standby Consumption (Inverter)	34 kWh/Year
CO ₂ Emissions avoided	27,010 kg / year

The results have been calculated with a mathematical model calculation from Valentin Software GmbH (PV*SOL algorithms). The actual yields from the solar power system may differ as a result of weather variations, the efficiency of the modules and inverter, and other factors.

Set-up of the System

Overview

System Data

Type of System	3D, Grid-connected PV System
----------------	------------------------------

Climate Data

Location	Kaunas, LTU (1996 - 2015)
Values source	Meteonorm 8.1
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Module Areas

1. Module Area - 1.1.

PV Generator, 1. Module Area - 1.1.

Name	1.1.
PV Modules	21 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	41.0 m ²

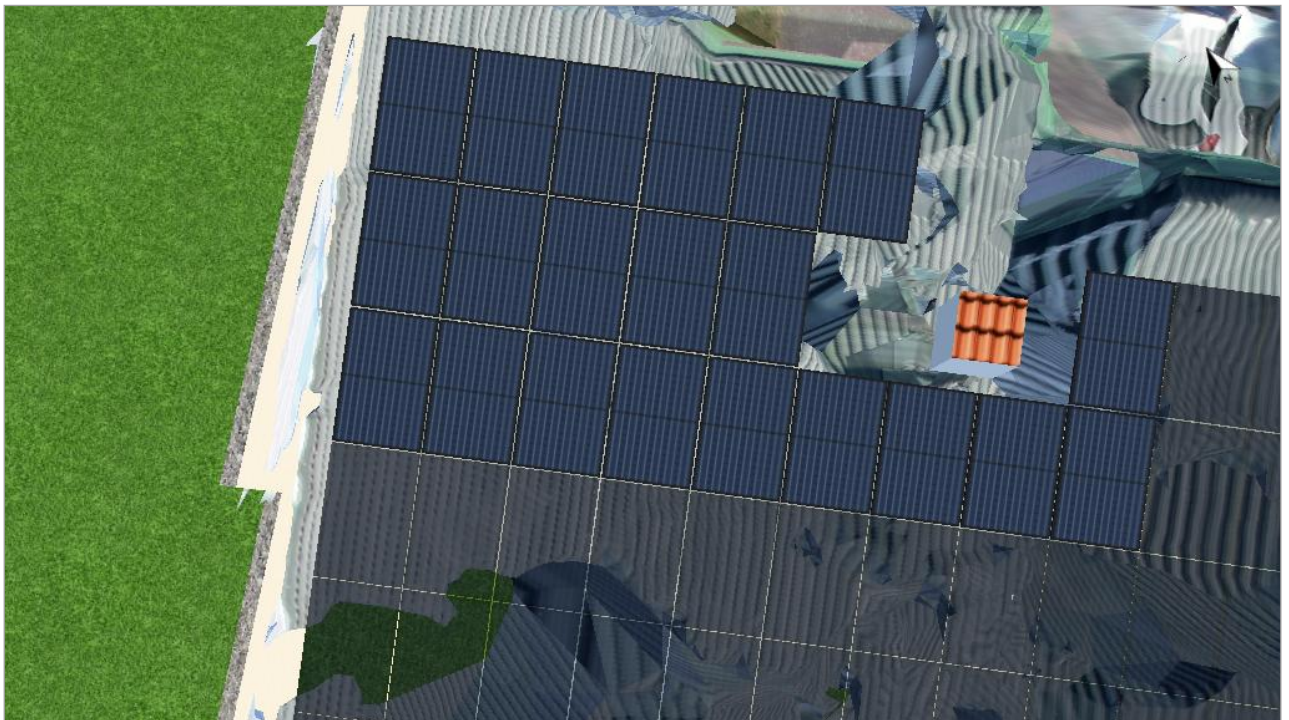


Figure: 1. Module Area - 1.1.

2. Module Area - 2.1.

PV Generator, 2. Module Area - 2.1.

Name	2.1.
PV Modules	18 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	35.1 m ²

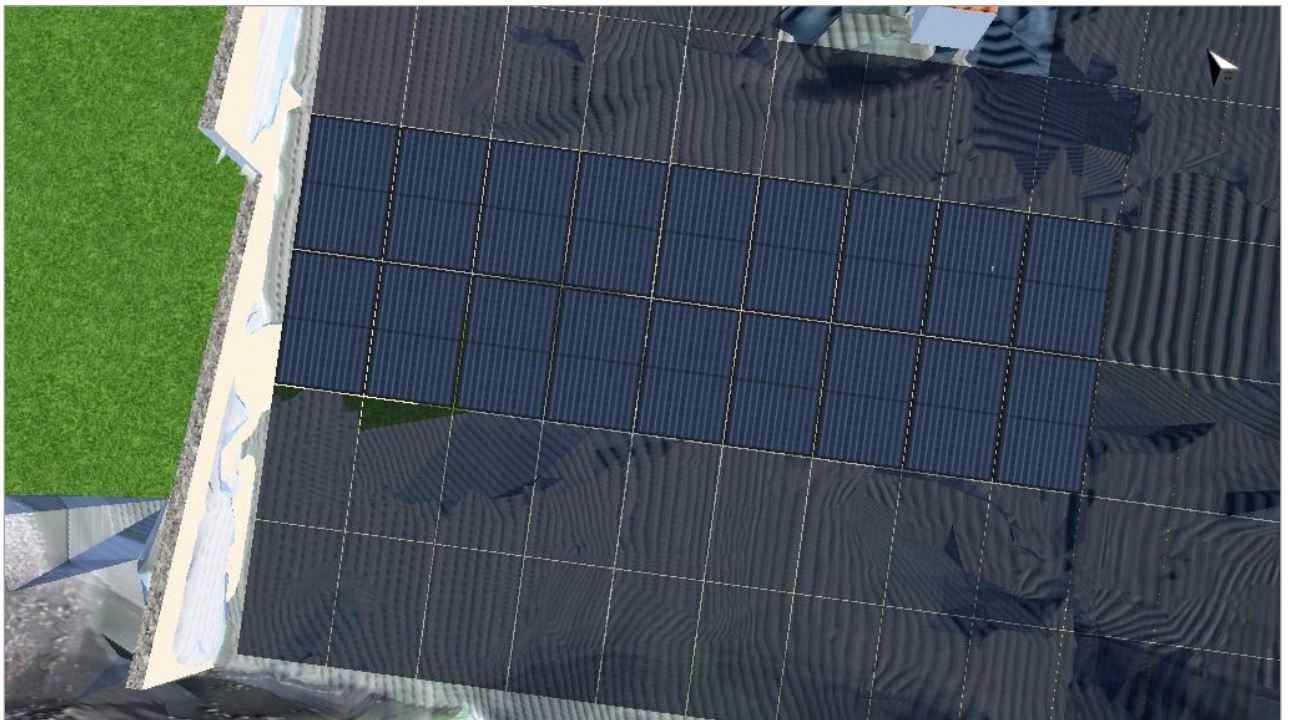


Figure: 2. Module Area - 2.1.

3. Module Area - 2.2.

PV Generator, 3. Module Area - 2.2.

Name	2.2.
PV Modules	18 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	35.1 m ²

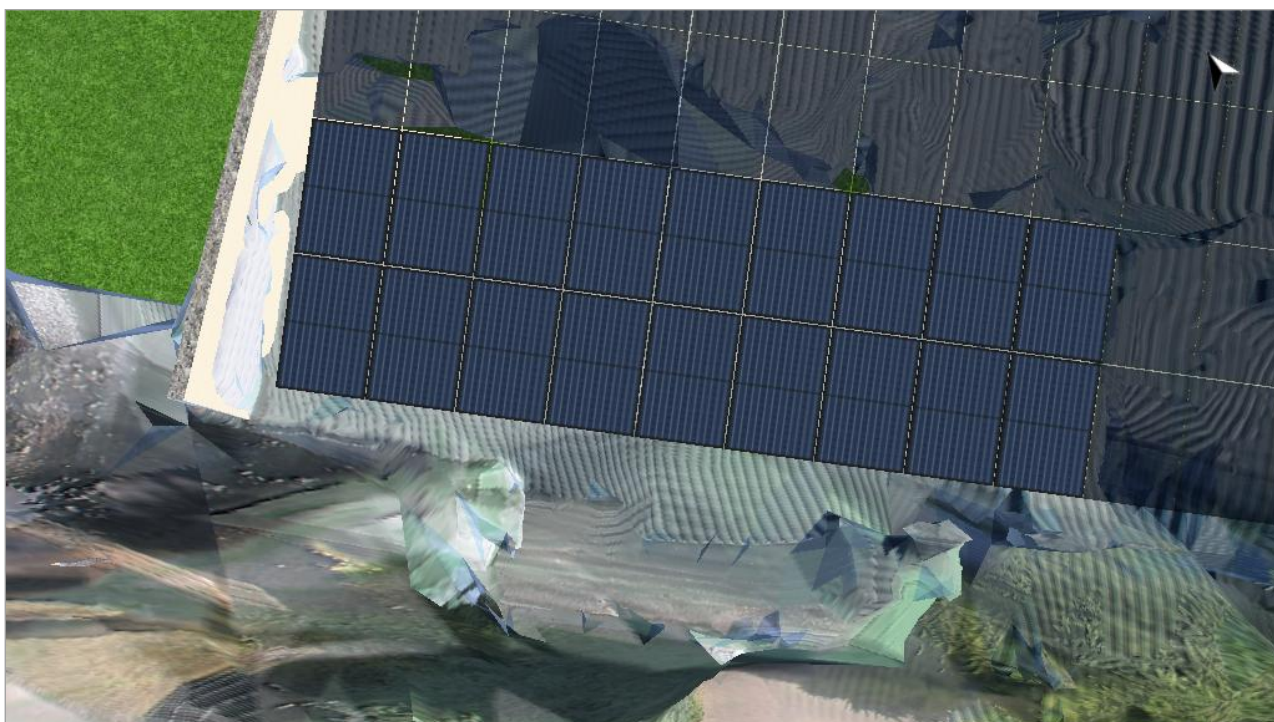


Figure: 3. Module Area - 2.2.

4. Module Area - 3.1.

PV Generator, 4. Module Area - 3.1.

Name	3.1.
PV Modules	21 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	41.0 m ²

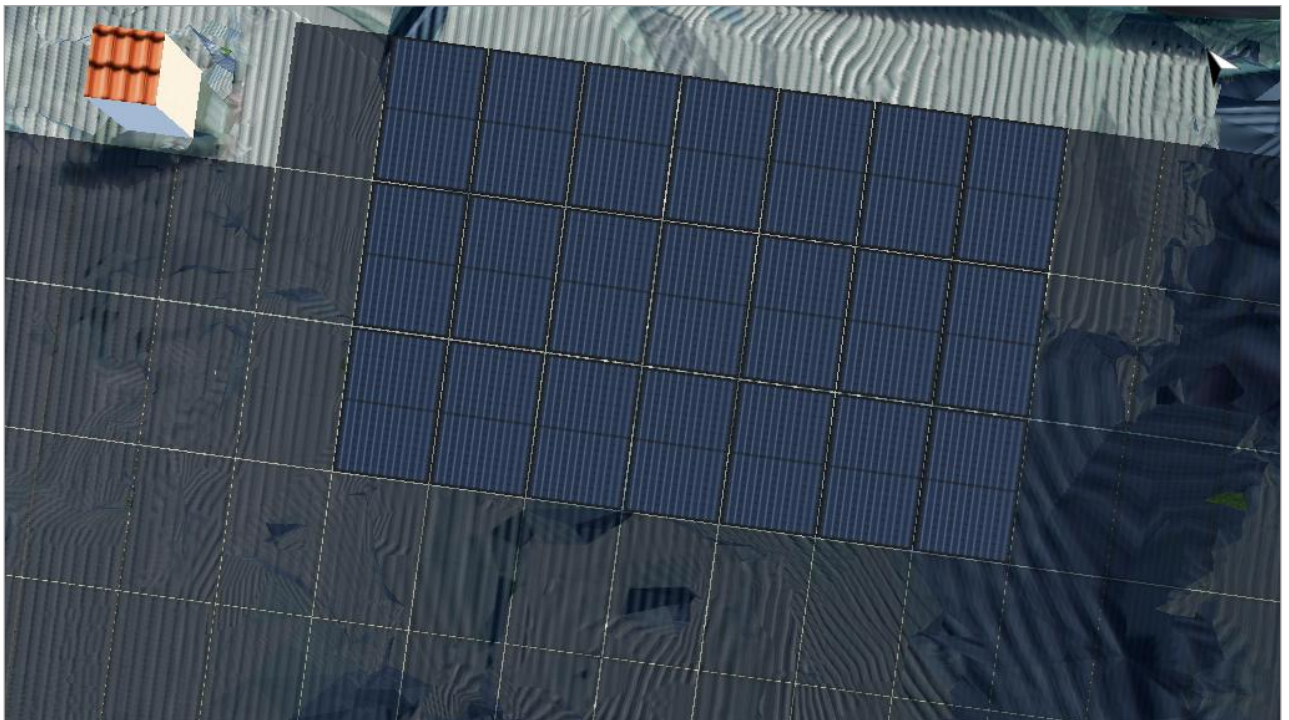


Figure: 4. Module Area - 3.1.

5. Module Area - 3.2.

PV Generator, 5. Module Area - 3.2.

Name	3.2.
PV Modules	21 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	41.0 m ²

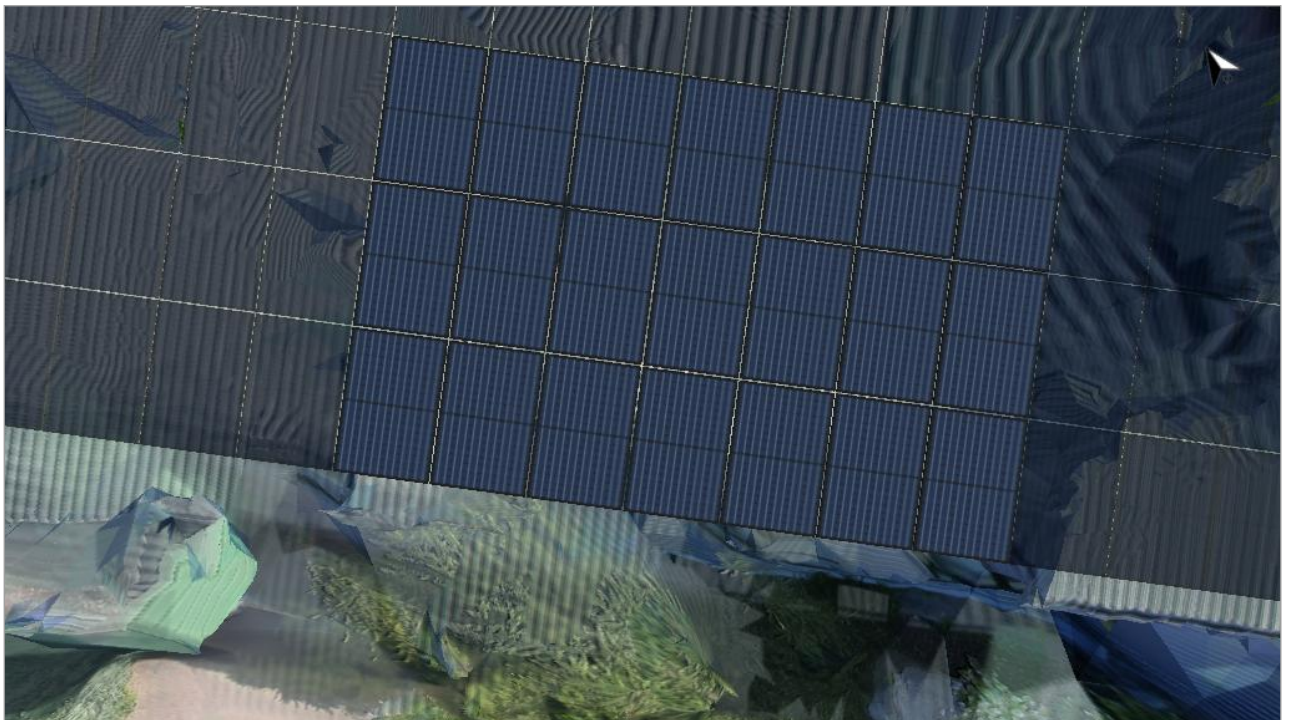


Figure: 5. Module Area - 3.2.

6. Module Area - 4.1.

PV Generator, 6. Module Area - 4.1.

Name	4.1.
PV Modules	20 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	39.1 m ²

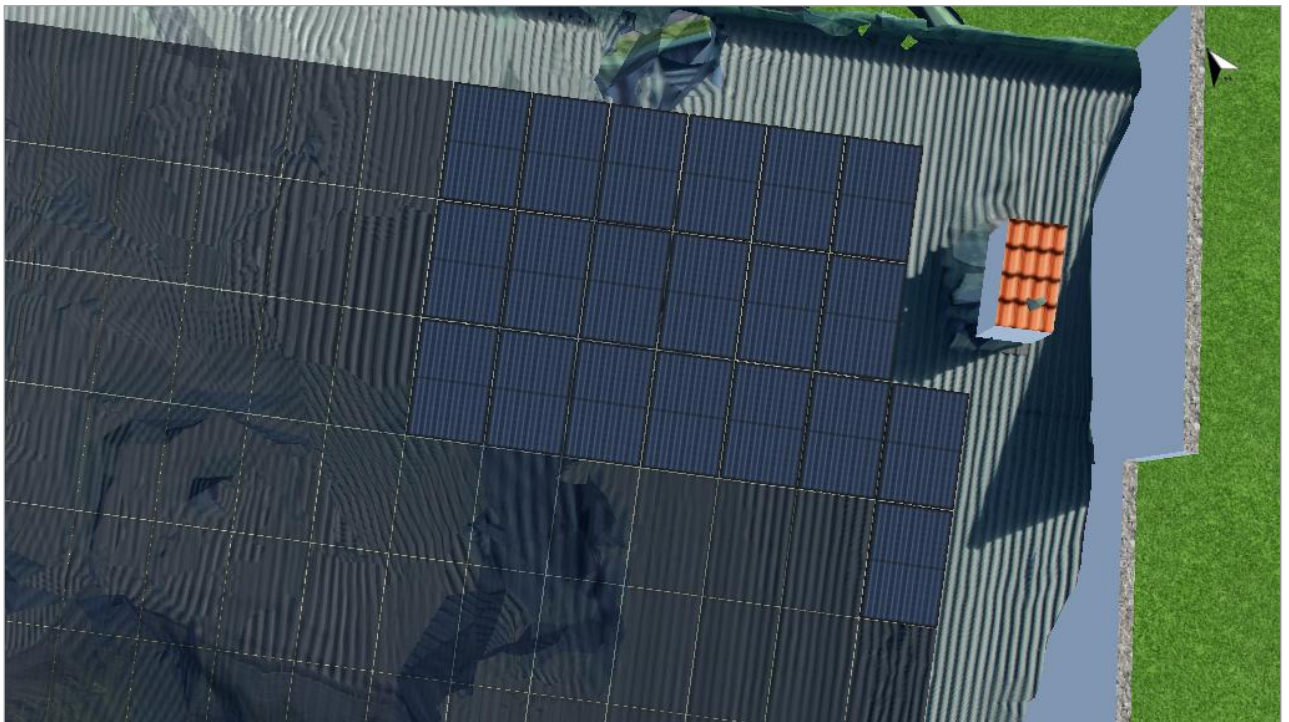


Figure: 6. Module Area - 4.1.

7. Module Area - 4.2.

PV Generator, 7. Module Area - 4.2.

Name	4.2.
PV Modules	20 x Q.PEAK DUO M-G11S+ 415 Rev1 (v1)
Manufacturer	Hanwha Q.CELLS
Inclination	11 °
Orientation	Southwest 214 °
Installation Type	Roof parallel
PV Generator Surface	39.1 m ²

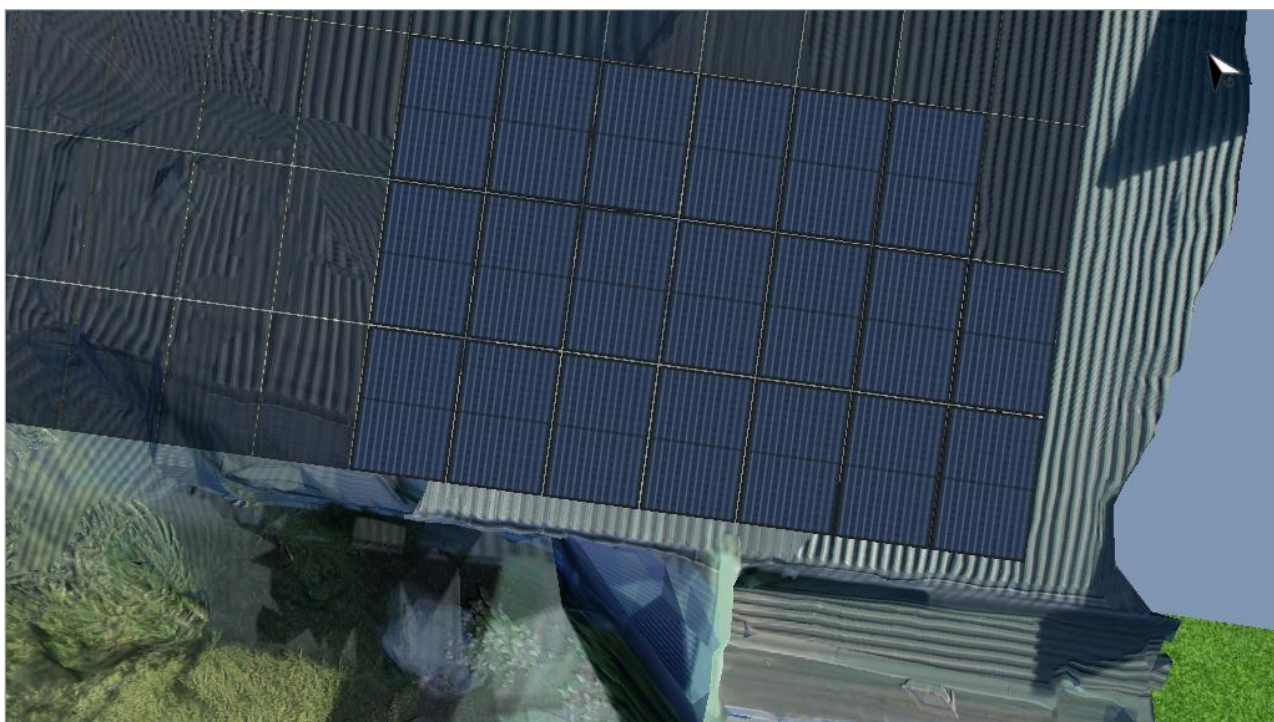


Figure: 7. Module Area - 4.2.

Horizon Line, 3D Design

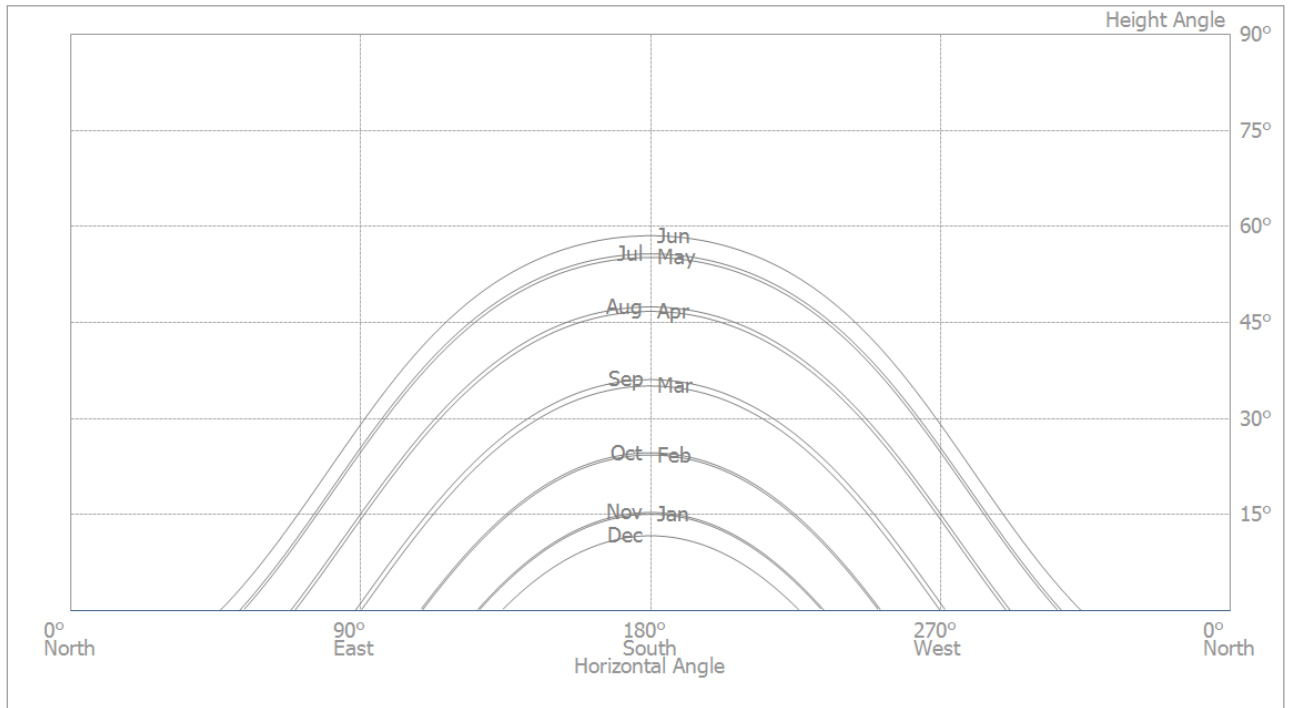


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Areas	1.1. + 2.1. + 2.2. + 3.1. + 3.2. + 4.1. + 4.2.
Inverter 1	
Model	SG50CX-P2 (v1)
Manufacturer	Sungrow Power Supply Co., Ltd.
Quantity	1
Sizing Factor	115.4 %
Configuration	MPP 1: 1 x 21
	MPP 2: 1 x 18 1 x 18
	MPP 3: 1 x 21 1 x 21
	MPP 4: 1 x 2 ☆ [1 x 1] + 1 x 18 1 x 2 ☆ [1 x 1] + 1 x 18
Power Optimizer	4x Tigo Energy, Inc. , TS4-A-O 700 W (v2)

AC Mains

AC Mains

Number of Phases	3
Mains voltage between phase and neutral	400 V
Displacement Power Factor (cos phi)	+/- 1

Simulation Results

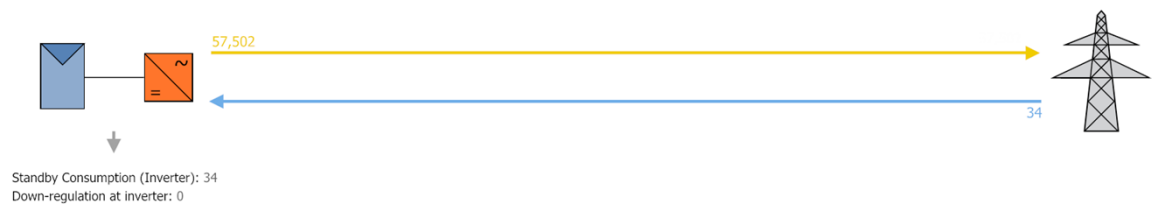
Results Total System

PV System

PV Generator Output	57.69 kWp
Spec. Annual Yield	996.24 kWh/kWp
Performance Ratio (PR)	91.10 %
Yield Reduction due to Shading	2.1 %
Grid Export	57,502 kWh/Year
Grid Export in the first year (incl. module degradation)	57,502 kWh/Year
Standby Consumption (Inverter)	34 kWh/Year
CO ₂ Emissions avoided	27,010 kg / year

Energy Flow Graph

Project:



All values in kWh
Small deviations in the totals can occur due to rounding
created with PV*SOL

Figure: Energy flow

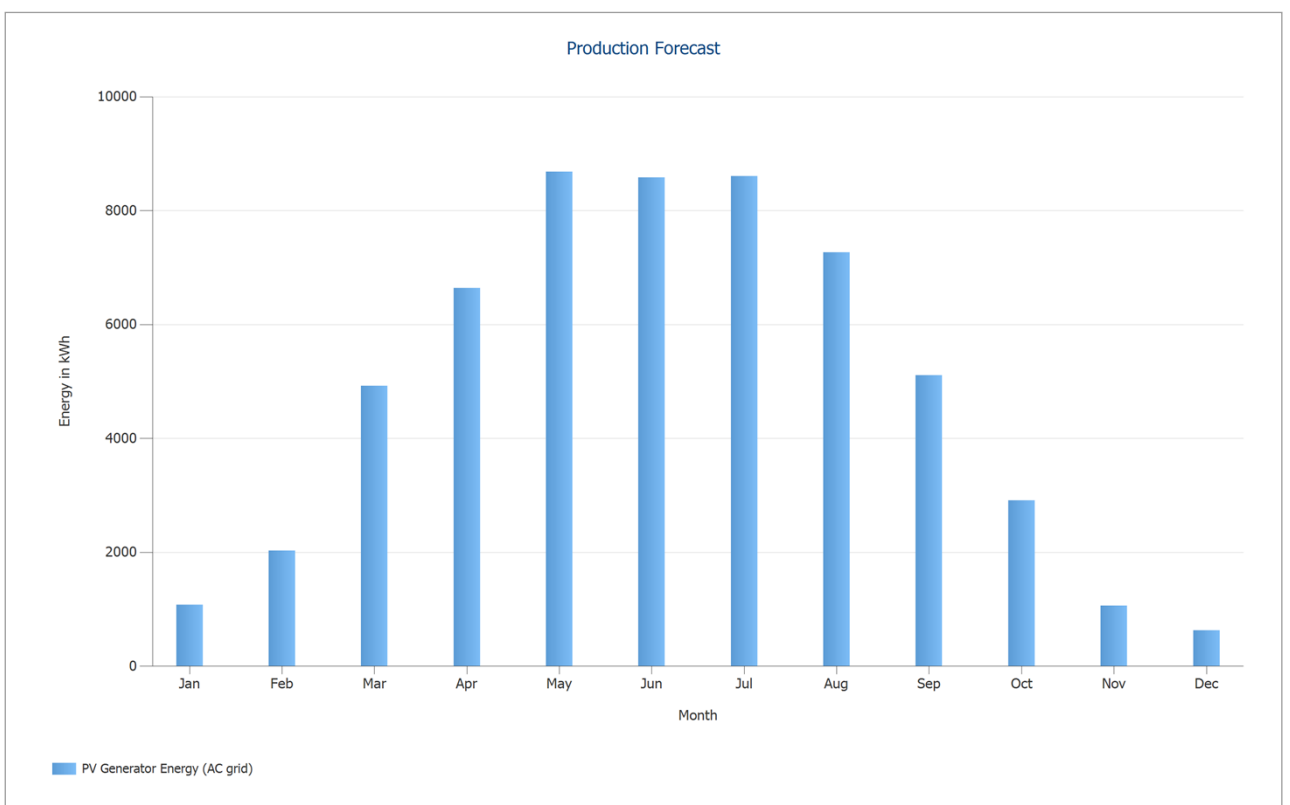


Figure: Production Forecast

PV System Energy Balance

PV System Energy Balance

Global radiation - horizontal	1,035.41 kWh/m²	
Deviation from standard spectrum	-10.35 kWh/m ²	-1.00 %
Ground Reflection (Albedo)	1.88 kWh/m ²	0.18 %
Orientation and inclination of the module surface	69.15 kWh/m ²	6.73 %
Module-independent shading	-2.91 kWh/m ²	-0.27 %
Reflection on the Module Interface	0.00 kWh/m ²	0.00 %
Global Radiation at the Module	1,093.17 kWh/m²	
	1,093.17 kWh/m ²	
	x 271.432 m ²	
	= 296,722.57 kWh	
Global PV Radiation	296,722.57 kWh	
Soiling	0.00 kWh	0.00 %
STC Conversion (Rated Efficiency of Module 21.26 %)	-233,641.74 kWh	-78.74 %
Rated PV Energy	63,080.83 kWh	
Module-specific Partial Shading	-741.45 kWh	-1.18 %
Low-light performance	-1,340.51 kWh	-2.15 %
Deviation from the nominal module temperature	-521.51 kWh	-0.85 %
Diodes	-42.49 kWh	-0.07 %
Mismatch (Manufacturer Information)	-1,176.30 kWh	-1.95 %
Mismatch (Configuration/Shading)	-303.07 kWh	-0.51 %
Power optimizer (DC conversion/down-regulation)	-6.77 kWh	-0.01 %
PV Energy (DC) without inverter down-regulation	58,948.73 kWh	
Failing to reach the DC start output	-0.72 kWh	0.00 %
Down-regulation on account of the MPP Voltage Range	-0.14 kWh	0.00 %
Down-regulation on account of the max. DC Current	0.00 kWh	0.00 %
Down-regulation on account of the max. DC Power	0.00 kWh	0.00 %
Down-regulation on account of the max. AC Power/cos phi	-0.02 kWh	0.00 %
MPP Matching	-6.43 kWh	-0.01 %
PV energy (DC)	58,941.42 kWh	
Energy at the Inverter Input	58,941.42 kWh	
Input voltage deviates from rated voltage	0.00 kWh	0.00 %
DC/AC Conversion	-1,439.82 kWh	-2.44 %
Standby Consumption (Inverter)	-33.66 kWh	-0.06 %
Total Cable Losses	0.00 kWh	0.00 %
PV energy (AC) minus standby use	57,467.94 kWh	
PV Generator Energy (AC grid)	57,501.60 kWh	

Data Sheets

PV Module Data Sheet

PV Module: Q.PEAK DUO M-G11S+ 415 Rev1 (v1)

Manufacturer	Hanwha Q.CELLS
Available	Yes

Electrical Data

Cell Type	Si monocrystalline
Half-cell module	Yes
Cell Count	108
Number of Bypass Diodes	3
Loss voltage per bypass diode	1 V
Integrated power optimizer	No
Only Transformer Inverters suitable	No

I/V Characteristics at STC

MPP Voltage	31.05 V
MPP Current	13.37 A
Open Circuit Voltage	37.14 V
Short-Circuit Current	13.99 A
Increase open circuit voltage before stabilisation	0 %
Nominal output	415 W
Fill Factor	79.9 %
Efficiency	21.26 %

I/V Part Load Characteristics

Values source	Manufacturer/user-created
Irradiance	200 W/m ²
Voltage in MPP at Part Load	29.84 V
Current in MPP at Part Load	2.671 A
Open Circuit Voltage (Part Load)	34.72 V
Short Circuit Current at Part Load	2.8 A

Additional Parameters

Temperature Coefficient of Voc	-100.1 mV/K
Temperature Coefficient of Isc	5.6 mA/K
Temperature Coefficient of Pmpp	-0.34 %/K
Incident Angle Modifier (IAM)	100 %
Maximum System Voltage	1000 V

Mechanical Data

Width	1134 mm
Height	1722 mm
Depth	30 mm
Frame Width	13 mm
Weight	21.1 kg

Power Optimizer Data Sheet

Power Optimizer: TS4-A-O 700 W (v2)

Manufacturer	Tigo Energy, Inc.
Available	Yes

Electrical Data

module-integrated	No
Optimizer mode	Buck
DC nominal output	700 W
Max. Input Voltage	80 V
Max. output voltage	-1 V
Max. Input Current	15 A
Max. output current	-1 A
Min. MPP Voltage	16 V
Max. MPP Voltage	80 V
Reduction of the open circuit voltage	0 %
Maximum string mismatch	25 %

Inverter Data Sheet

Inverter: SG50CX-P2 (v1)

Manufacturer	Sungrow Power Supply Co., Ltd.
Available	Yes
Electrical data - DC	
DC nominal output	50 kW
Max. DC Power	70 kW
Nom. DC Voltage	600 V
Max. Input Voltage	1040 V
Max. Input Current	120 A
Max. short circuit current	160 A
Number of DC Inlets	8
Electrical data - AC	
AC Power Rating	50 kW
Max. AC Power	55 kVA
Number of Phases	3
With Transformer	No
Electrical data - other	
Change in Efficiency when Input Voltage deviates from Rated Voltage	0.02 %/100V
Min. Feed-in Power	20 W
Standby Consumption	20 W
Night Consumption	4 W
MPP Tracker	
Output Range < 20% of Power Rating	99.9 %
Output Range > 20% of Power Rating	100 %
Count of MPP Trackers	4
MPP Tracker 1-4	
Max. Input Current	30 A
Max. short circuit current	35 A
Max. Input Power	22.1 kW
Min. MPP Voltage	200 V
Max. MPP Voltage	1000 V

Plans and parts list

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		Hanwha Q.CELLS	Q.PEAK DUO M-G11S+ 415 Rev1	139	Piece
2	Inverter		Sungrow Power Supply Co., Ltd.	SG50CX-P2	1	Piece
3	Power Optimizer		Tigo Energy, Inc.	TS4-A-O 700 W	4	Piece

Screenshots, 3D Design Environment

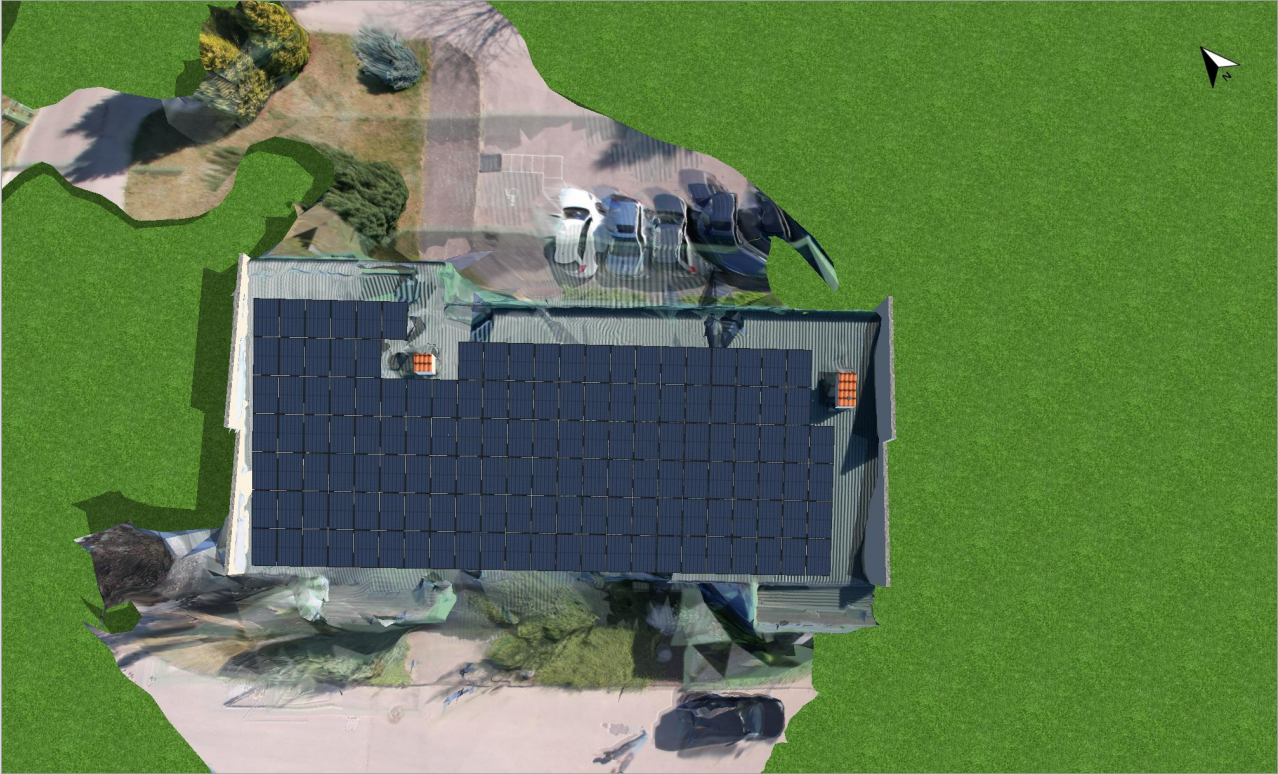


Figure: Screenshot01



Figure: Pietūs

Configuration

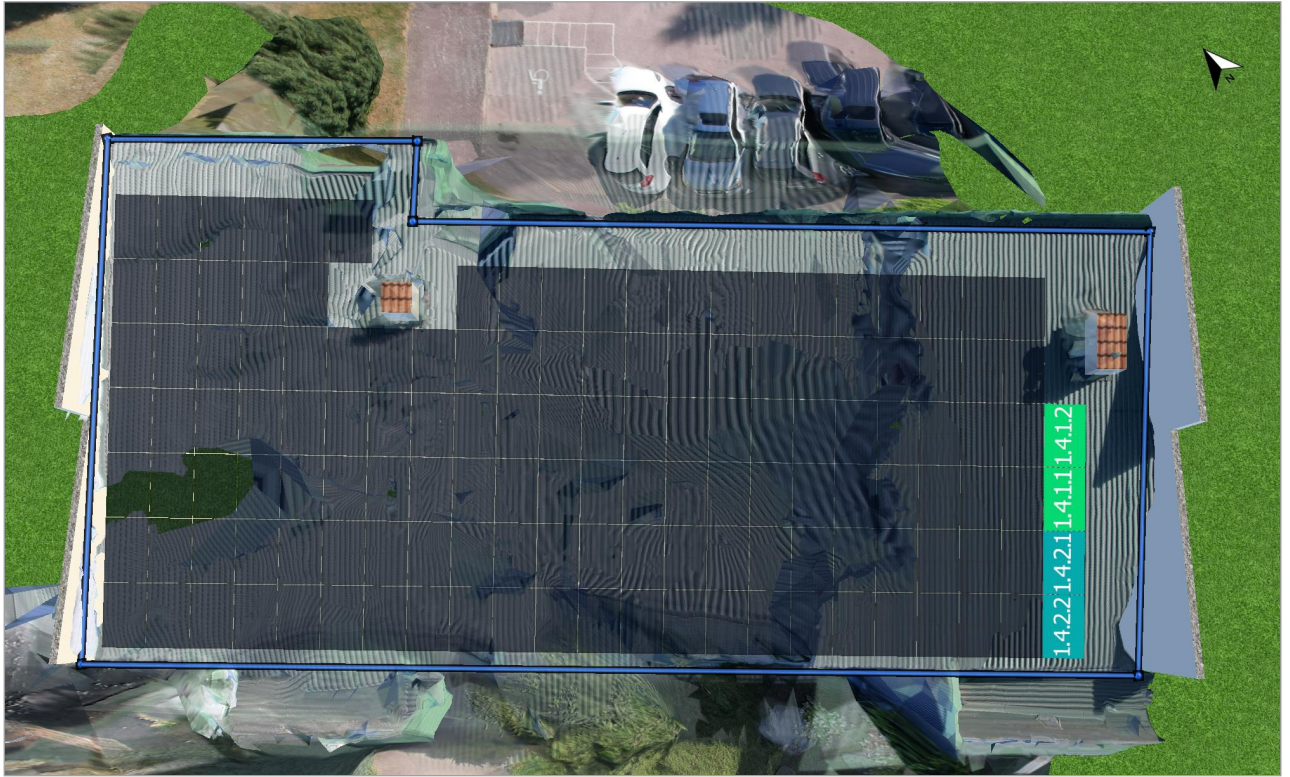


Figure: optimizuoti moduliai

Shading

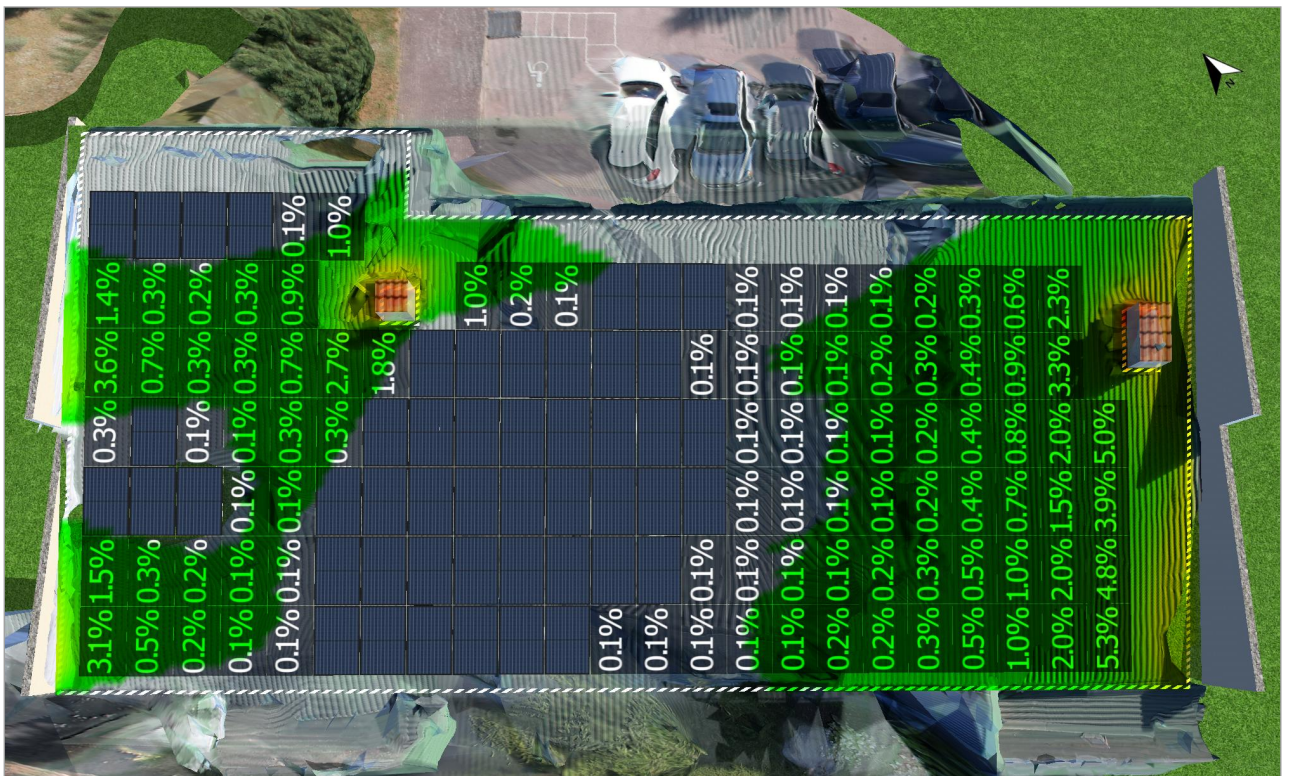


Figure: Screenshot03