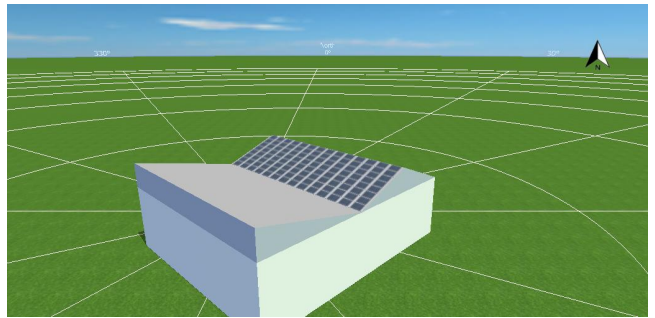


Project Name: სამტრედიის იუსტიციის სახლის
პროექტი

1/20/2020

ქსელური მზის ელექტროსადგური

სამტრედიის იუსტიციის სახლის პროექტი



პროექტის მიმოხილვა

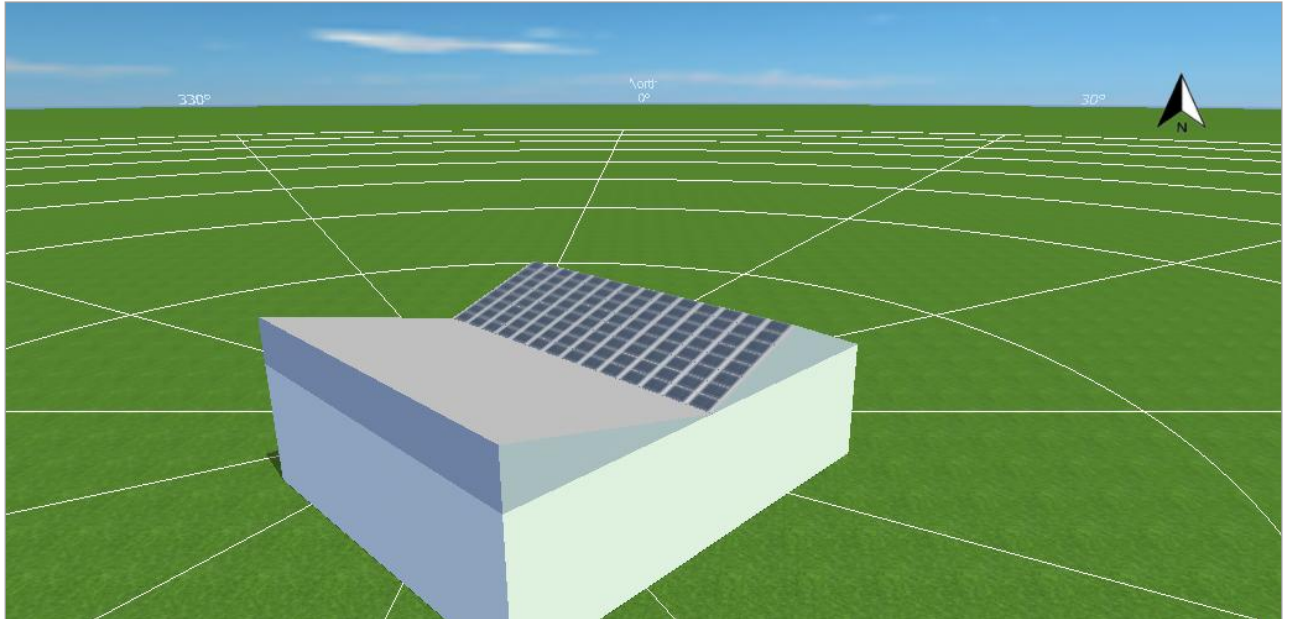


Figure: Overview Image, 3D Design

მზის ელ. სადგურის სისტემა

3D, ქსელზე დაერთებული

Climate Data/კლიმატის მონაცემები	Samtredia, GEO (1991 - 2010)
PV Generator Output/მზის ელ. სადგურის სიმძლავრე	71.68 kWp
PV Generator Surface/მზის ელ. სადგურის მოცულობა	372.5 m ²
Number of PV Modules/მზის პანელების რაოდენობა	224
Number of Inverters/გარდამქნელების რაოდენობა	2

სამტრედიის იუსტიციის სახლის პროექტი

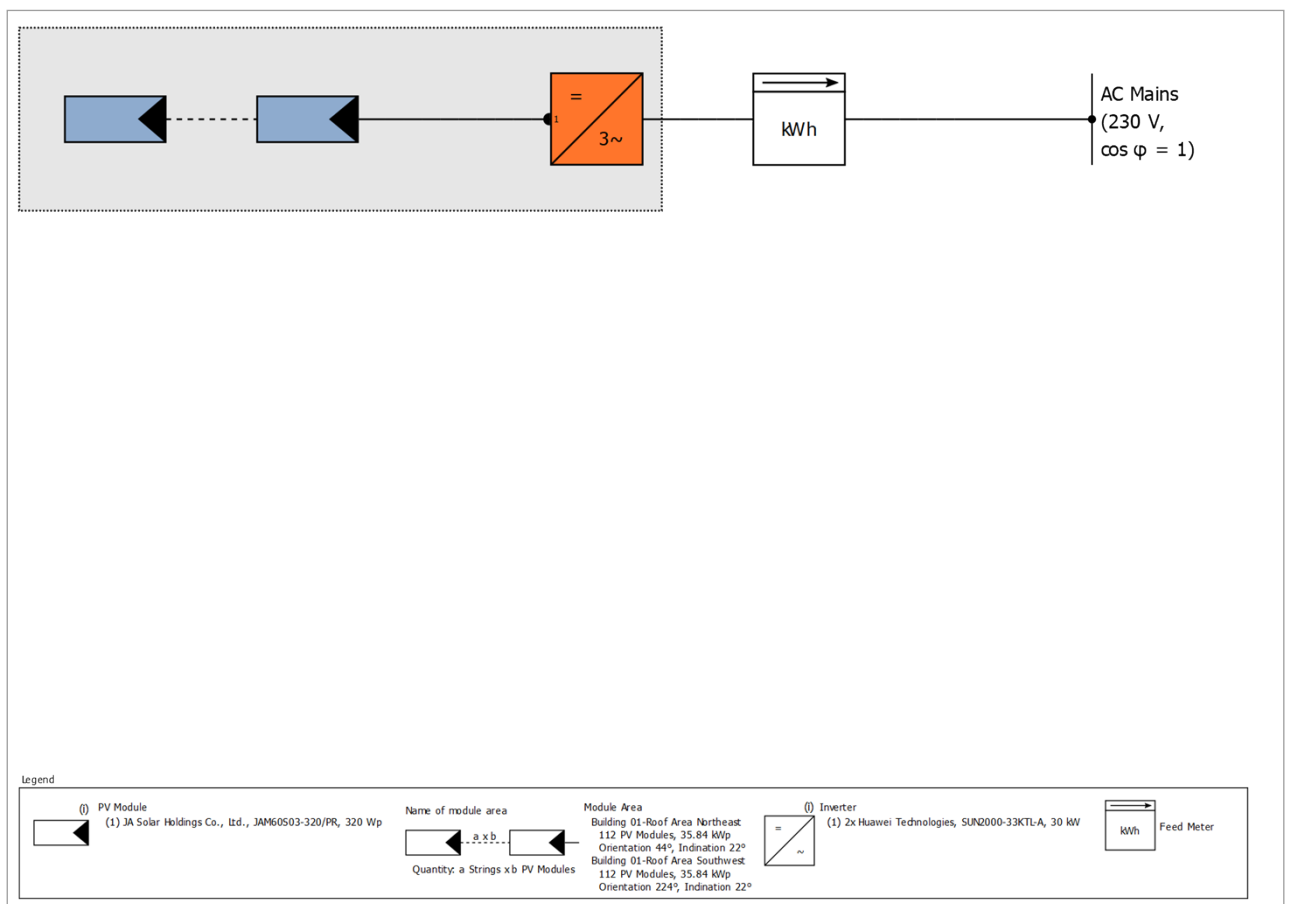


Figure: Schematic diagram

გამომუშავება

The yield

PV Generator Energy (AC grid)/სადგურის გამომუშავება	76,366 kWh
Grid Feed-in/ქსელში გაშვებული ენერგია	76,366 kWh
Down-regulation at Feed-in Point	0 kWh
Own Power Consumption	0.0 %
Solar Fraction	0.0 %
Spec. Annual Yield/ერთი კვტ დადგმული სიმძლავრის წლიური გამომუშავება	1,065.37 kWh/kWp
Performance Ratio (PR)/მარგი ქმედების კოეფ.	86.8 %
Yield Reduction due to Shading/დაჩრდილვის დანაკარგი	2.5 %/year
CO ₂ Emissions avoided/თავიდან აცილებული CO ₂	45,819 kg / year

Financial Analysis

Your Gain

Total investment costs	-----\$
Return on Assets	----- %
Amortization Period	----- Years
Electricity Production Costs	0.05 \$/kWh
Energy Balance/Feed-in Concept	Full Feed-in

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
Start of Operation	9/25/2019

Climate Data

Location	Samtredia, GEO (1991 - 2010)
Resolution of the data	1 h
Simulation model used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

პირველი სახურავი

1. მზის პანელების განთავსების მონაცემები

PV Generator, 1. Module Area - Building 01-Roof Area Northeast

Name	Building 01-Roof Area Northeast
PV Modules/მზის პანელები	112 x -----320/PR
Manufacturer	-----
Inclination/დახრა	22 °
Orientation/მიმართულება	Northeast 44 °
Installation Type/ინსტალაციის ტიპი	Roof parallel
PV Generator Surface/სადგურის მოცულობა	186.2 m ²

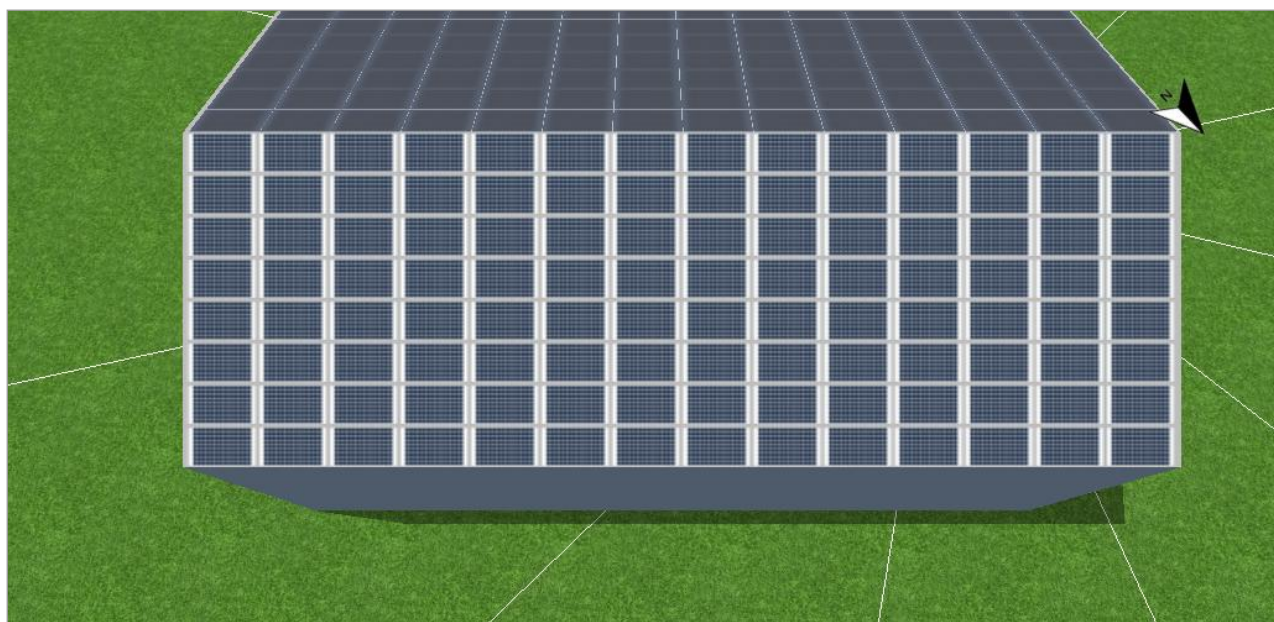


Figure: 1. Module Area - Building 01-Roof Area Northeast

2. მზის პანელების განთავსების მონაცემები II სახურავისთვის

PV Generator, 2. Module Area - Building 01-Roof Area Southwest

Name	Building 01-Roof Area Southwest
PV Modules/მზის პანელები	112 x -----320watt/PR
Manufacturer	-----
Inclination/დახრა	22 °
Orientation/მიმართულება	Southwest 224 °
Installation Type/ინსტალაციის ტიპი	Roof parallel
PV Generator Surface/სადგურის მოცულობა	186.2 m ²

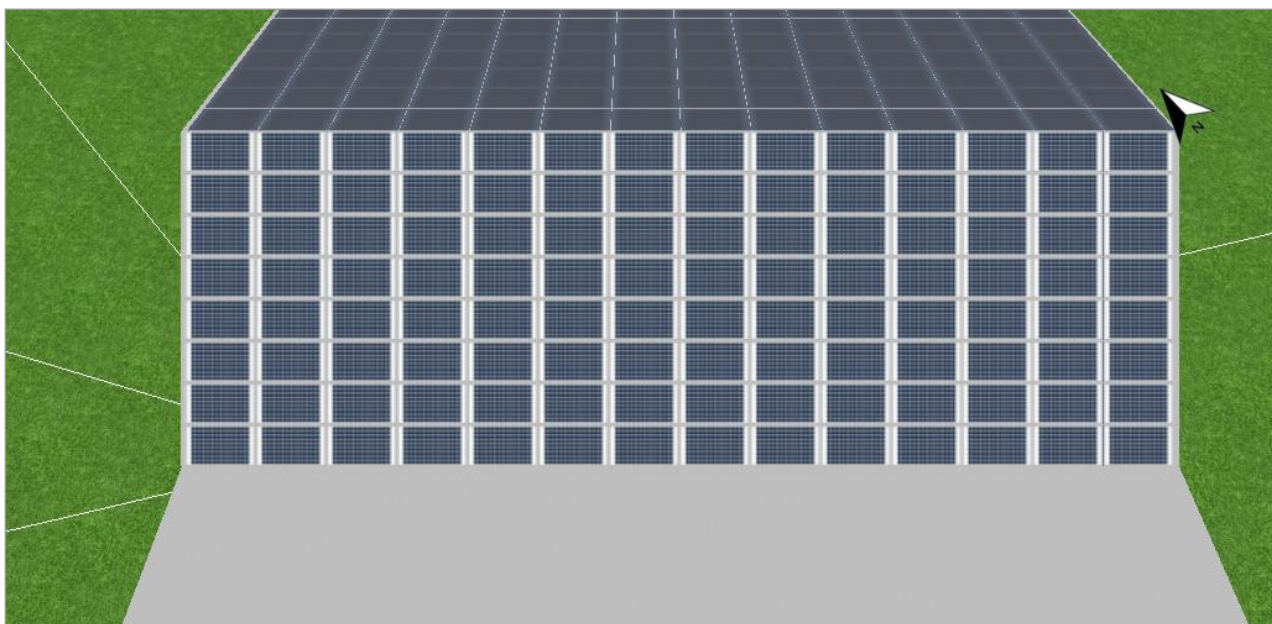


Figure: 2. Module Area - Building 01-Roof Area Southwest

Horizon Line, 3D Design

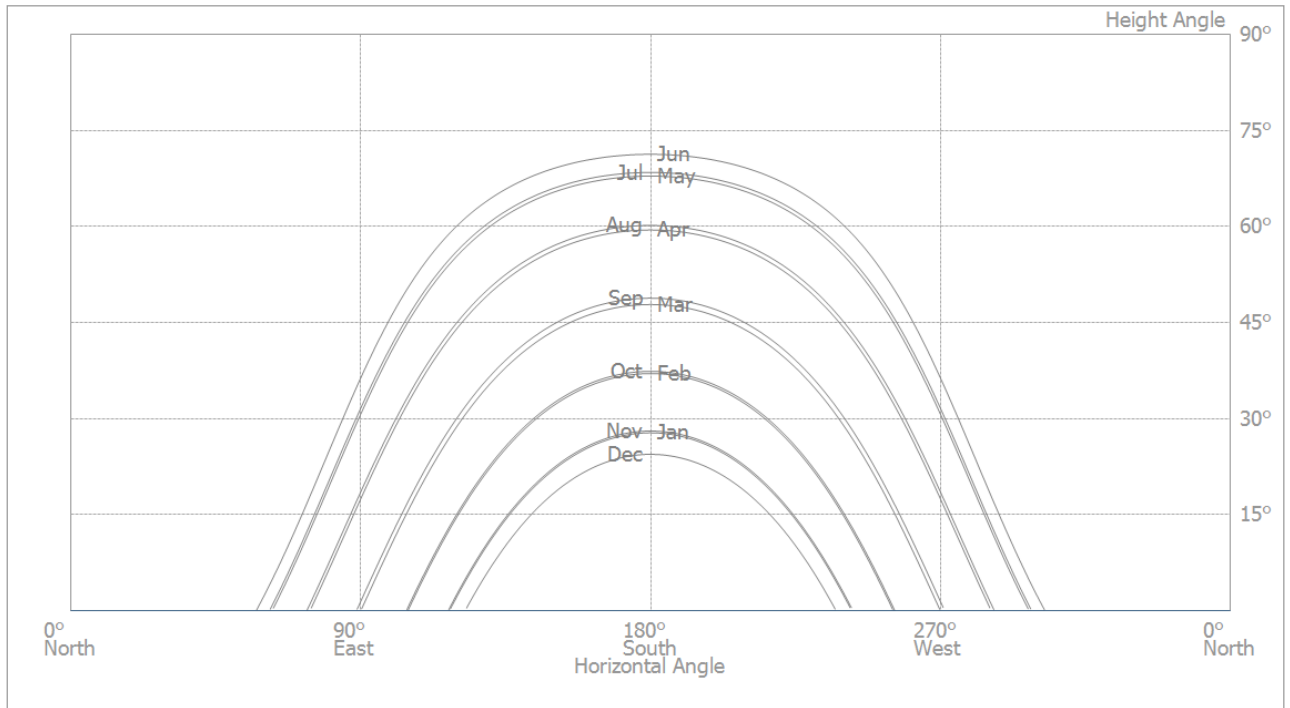


Figure: Horizon (3D Design)

გარდამქნელების კონფიგურაცია

Configuration 1

Module Area	Building 01-Roof Area Northeast
Inverter 1	
Manufacturer	-----
Model	
Quantity	1
Sizing Factor	119.5 %
Configuration	MPP 1: 2 x 18
	MPP 2: 2 x 17
	MPP 3: 1 x 21
	MPP 4: 1 x 21

Configuration 2

Module Area	Building 01-Roof Area Southwest
Inverter 1	
Manufacturer	
Model	
Quantity	1
Sizing Factor	119.5 %
Configuration	MPP 1: 2 x 18
	MPP 2: 2 x 17
	MPP 3: 1 x 21
	MPP 4: 1 x 21

AC Mains

AC Mains

Number of Phases	3
Mains Voltage (1-phase)	230 V
Displacement Power Factor (cos phi)	+/- 1

სიმულაციის მაჩვენებელი

Results Total System

PV System

PV Generator Output/მზის ელ-სადგურის ჯამური წლიური გამოშვება	71.7 kWp
Spec. Annual Yield	1,065.37 kWh/kWp
Performance Ratio (PR)	86.8 %
Yield Reduction due to Shading	2.5 %/year
Grid Feed-in	76,366 kWh/year
Grid Feed-in in the first year (incl. module degradation)	76,366 kWh/year
Standby Consumption (Inverter)	24 kWh/year
CO ₂ Emissions avoided	45,819 kg / year

Energy Flow Graph

Project: სამტრედია იუსტიციის სახლი



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

Figure: Energy Flow Graph

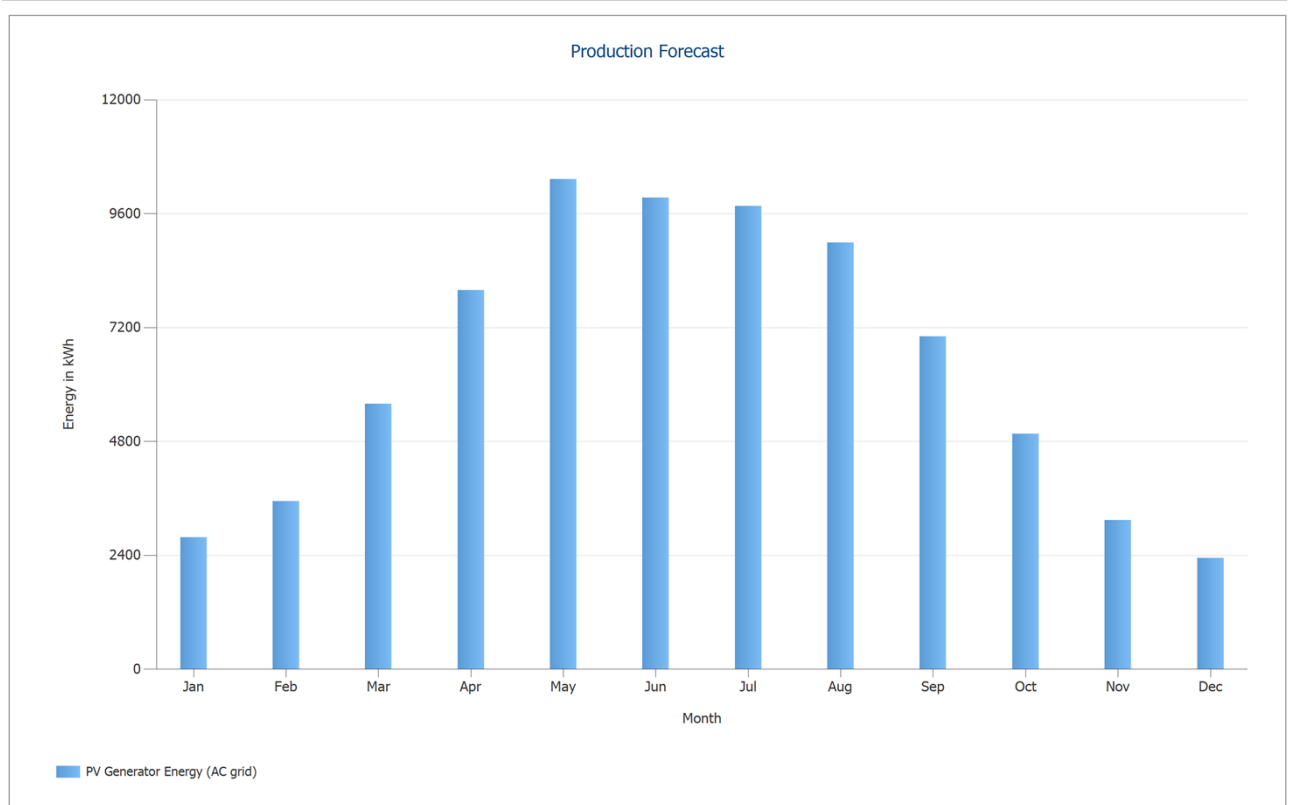


Figure: Production Forecast

Results per Module Area

Building 01-Roof Area Northeast

PV Generator Output	35.84 kWp
PV Generator Surface	186.2 m ²
Global Radiation at the Module	1061.7 kWh/m ²
PV Generator Energy (AC grid)	33351.2 kWh/year
Spec. Annual Yield	930.6 kWh/kWp
Performance Ratio (PR)	87.6 %

Building 01-Roof Area Southwest

PV Generator Output	35.84 kWp
PV Generator Surface	186.2 m ²
Global Radiation at the Module	1392.3 kWh/m ²
PV Generator Energy (AC grid)	43014.5 kWh/year
Spec. Annual Yield	1200.2 kWh/kWp
Performance Ratio (PR)	86.2 %

მზის ელ-სადგური ენერგ. ბალანსი

PV System Energy Balance

Global radiation - horizontal	1,296.53 kWh/m²	
Deviation from standard spectrum	-12.97 kWh/m ²	-1.00 %
Ground Reflection (Albedo)	9.35 kWh/m ²	0.73 %
Orientation and inclination of the module surface	-65.92 kWh/m ²	-5.10 %
Module-independent shading	0.00 kWh/m ²	0.00 %
Reflection on the Module Interface	-29.60 kWh/m ²	-2.41 %
Global Radiation at the Module	1,197.39 kWh/m²	
	1,197.39 kWh/m ²	
	x 372.49 m ²	
	= 446,015.57 kWh	
Global PV Radiation	446,015.57 kWh	
Soiling	0.00 kWh	0.00 %
STC Conversion (Rated Efficiency of Module 19.25 %)	-360,169.34 kWh	-80.75 %
Rated PV Energy	85,846.23 kWh	
Module-specific Partial Shading	-1,772.13 kWh	-2.06 %
Low-light performance	-1,639.85 kWh	-1.95 %
Deviation from the nominal module temperature	-2,626.72 kWh	-3.19 %
Diodes	-66.59 kWh	-0.08 %
Mismatch (Manufacturer Information)	-1,594.82 kWh	-2.00 %
Mismatch (Configuration/Shading)	-153.79 kWh	-0.20 %
PV Energy (DC) without inverter down-regulation	77,992.34 kWh	
Failing to reach the DC start output	-15.89 kWh	-0.02 %
Down-regulation on account of the MPP Voltage Range	-34.06 kWh	-0.04 %
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	-22.42 kWh	-0.03 %
MPP Matching	-49.95 kWh	-0.06 %
PV energy (DC)	77,870.01 kWh	
Energy at the Inverter Input	77,870.01 kWh	
Input voltage deviates from rated voltage	-92.37 kWh	-0.12 %
DC/AC Conversion	-1,412.03 kWh	-1.82 %
Standby Consumption (Inverter)	-24.17 kWh	-0.03 %
Total Cable Losses	0.00 kWh	0.00 %
PV energy (AC) minus standby use	76,341.44 kWh	
Grid Feed-in	76,365.56 kWh	

Data Sheets

PV Module Data Sheet

PV Module: 320watt/PR

Manufacturer	
Available	Yes
Electrical Data	
Cell Type	Si monocrystalline
Only Transformer Inverters suitable	No
Number of Cells	120
Number of Bypass Diodes	3
Mechanical Data	
Width	991 mm
Height	1678 mm
Depth	35 mm
Frame Width	35 mm
Weight	18.5 kg
Framed	No
I/V Characteristics at STC	
MPP Voltage	33.34 V
MPP Current	9.6 A
Nominal output	320 W
Open Circuit Voltage	40.22 V
Short-Circuit Current	10.16 A
Increase open circuit voltage before stabilisation	0 %
I/V Part Load Characteristics	
Values source	Manufacturer/user-created
Irradiance	200 W/m ²
Voltage in MPP at Part Load	32.49 V
Current in MPP at Part Load	1.95 A
Open Circuit Voltage (Part Load)	36.64 V
Short Circuit Current at Part Load	2.16 A
Further	
Voltage Coefficient	-116.24 mV/K
Electricity Coefficient	5.18 mA/K
Output Coefficient	-0.36 %/K
Incident Angle Modifier	98 %
Maximum System Voltage	1000 V
Spec. Heat Capacity	920 J/(kg*K)
Absorption Coefficient	70 %
Emissions Coefficient	85 %

Inverter Data Sheet

Inverter:

Manufacturer	Available	Yes
Electrical Data		
DC nominal output		30.6 kW
AC Power Rating		30 kW
Max. DC Power		30.6 kW
Max. AC Power		30 kVA
Standby Consumption		10 W
Night Consumption		1 W
Feed-in from		80 W
Max. Input Current		88 A
Max. Input Voltage		1100 V
Nom. DC Voltage		620 V
Number of Feed-in Phases		3
Number of DC Inlets		8
With Transformer		No
Change in Efficiency when Input Voltage deviates from Rated Voltage		0.3 %/100V
MPP Tracker		
Output Range < 20% of Power Rating		99.8 %
Output Range > 20% of Power Rating		99.95 %
No. of MPP Trackers		4
Max. Input Current per MPP Tracker		22 A
Max. Input Power per MPP Tracker		13.8 kW
Min. MPP Voltage		200 V
Max. MPP Voltage		1000 V

Plans

წრედის გეგმა

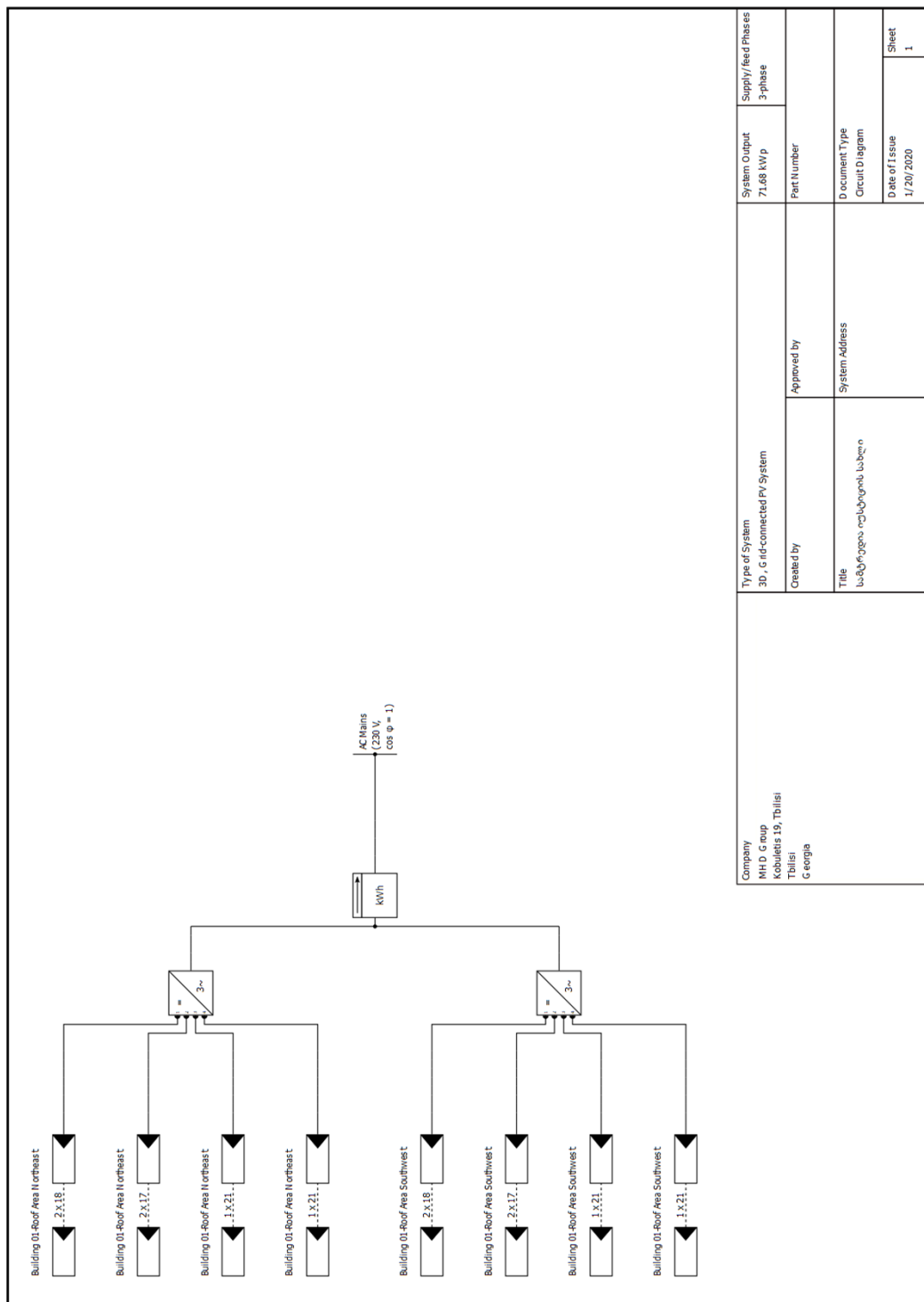


Figure: Circuit Diagram

Dimensioning Plan

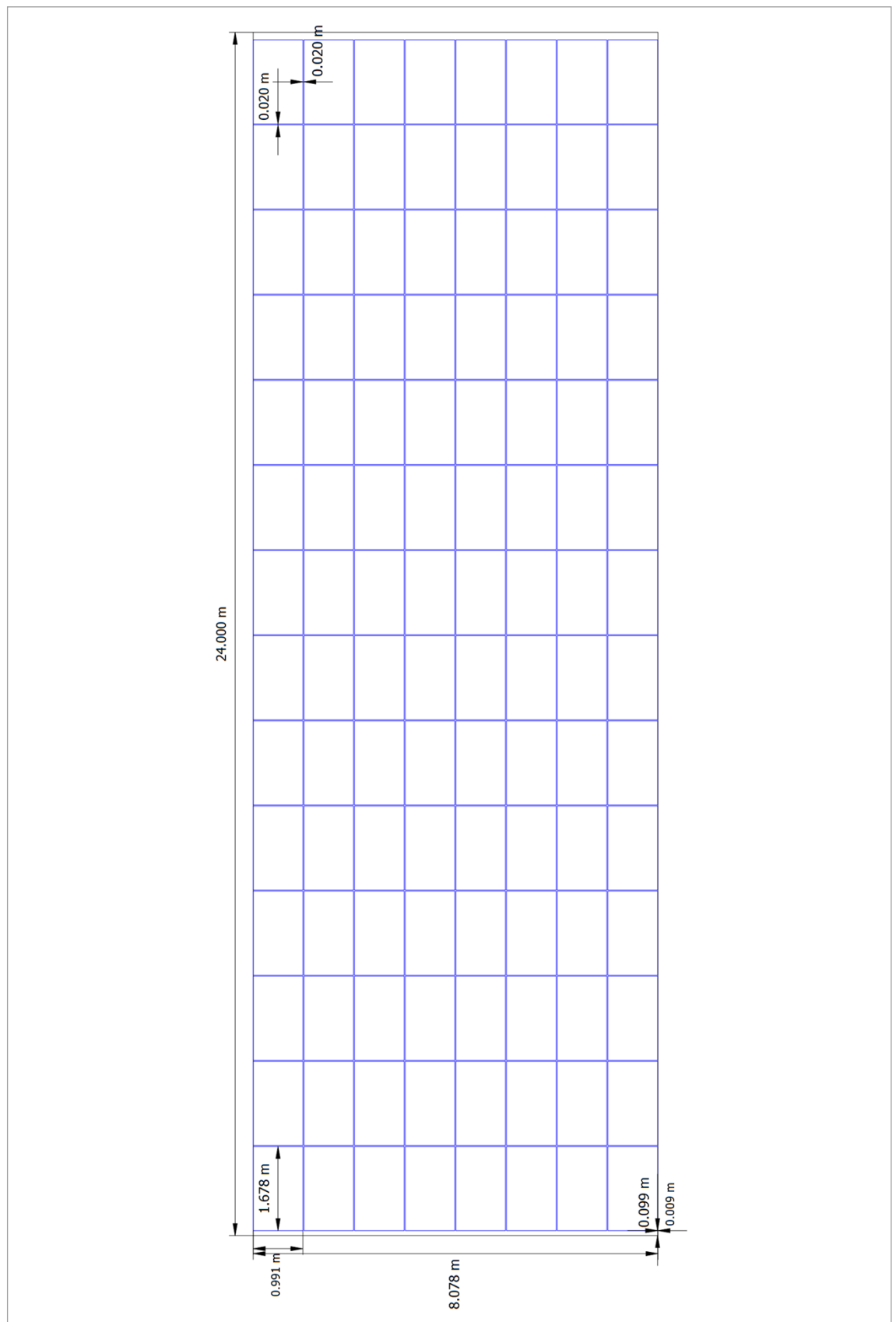


Figure: Building 01-Roof Area Southwest

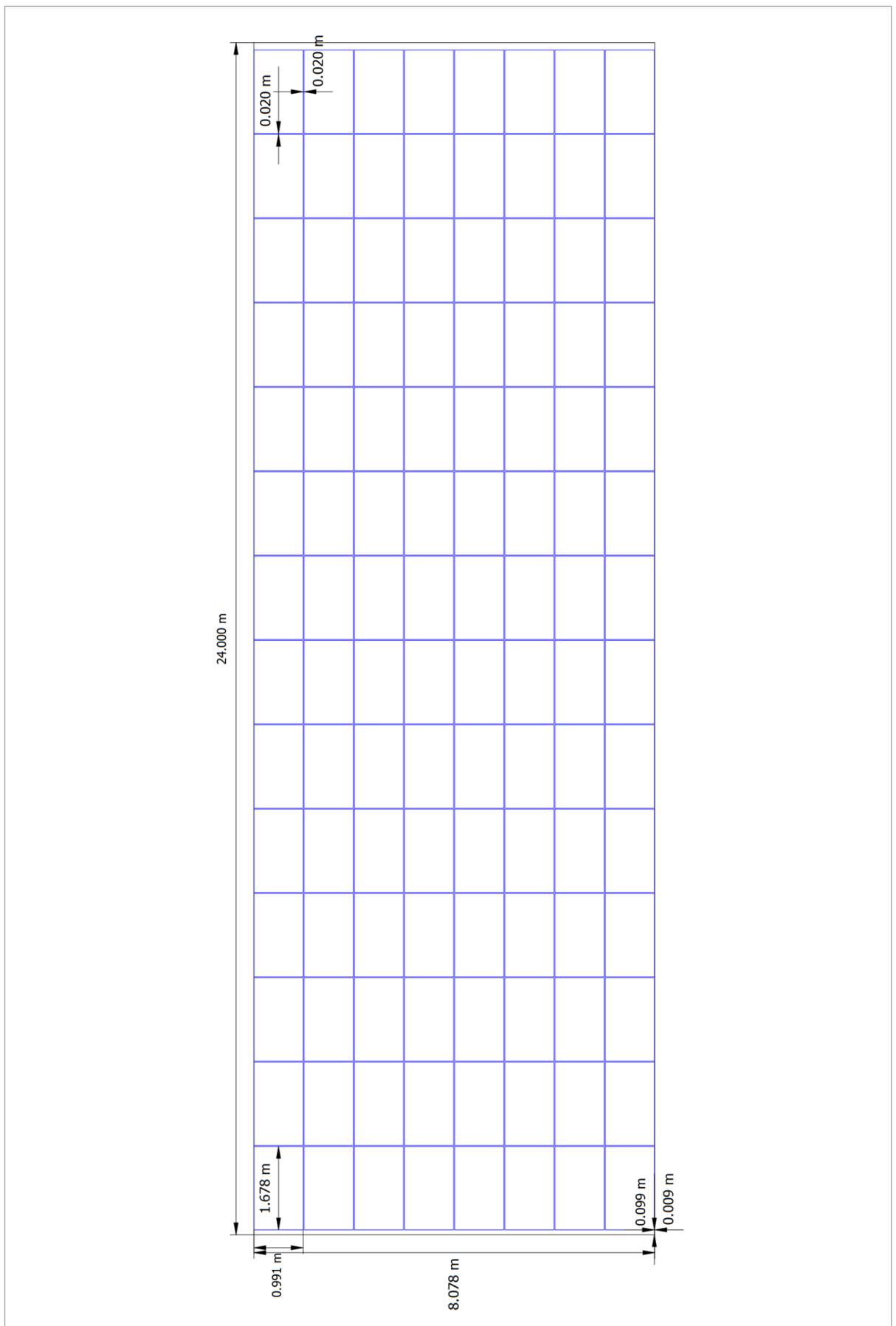


Figure: Building 01-Roof Area Northeast

Screenshots, 3D Design Environment

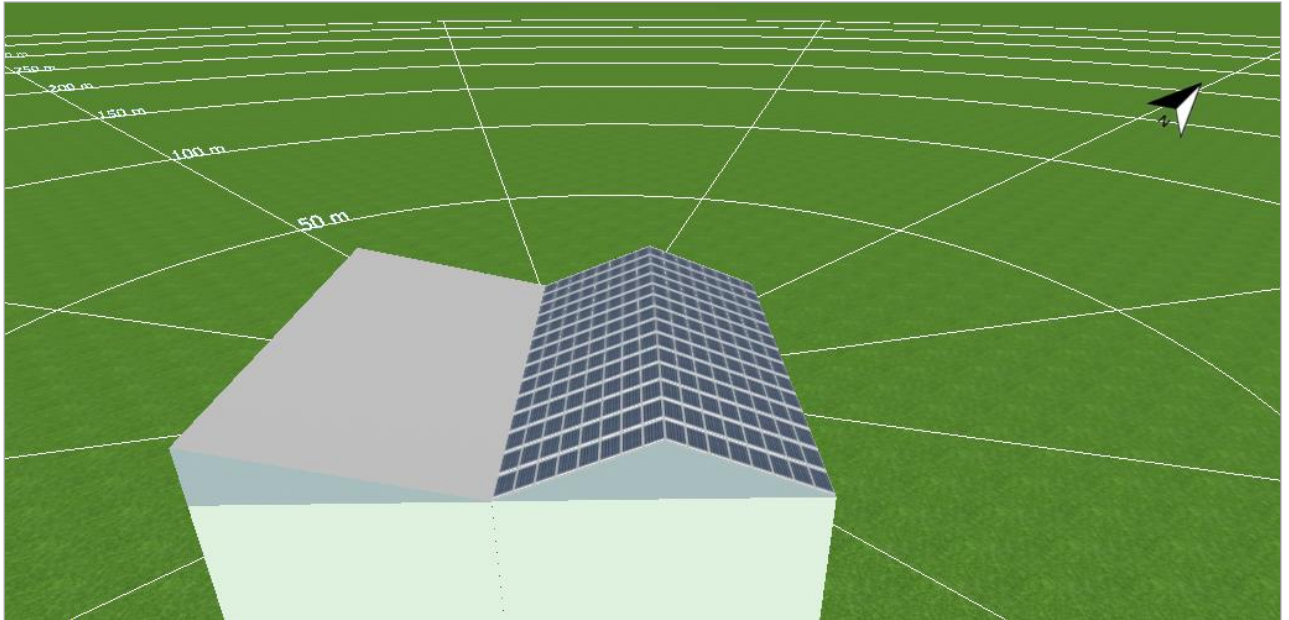


Figure: Screenshot01

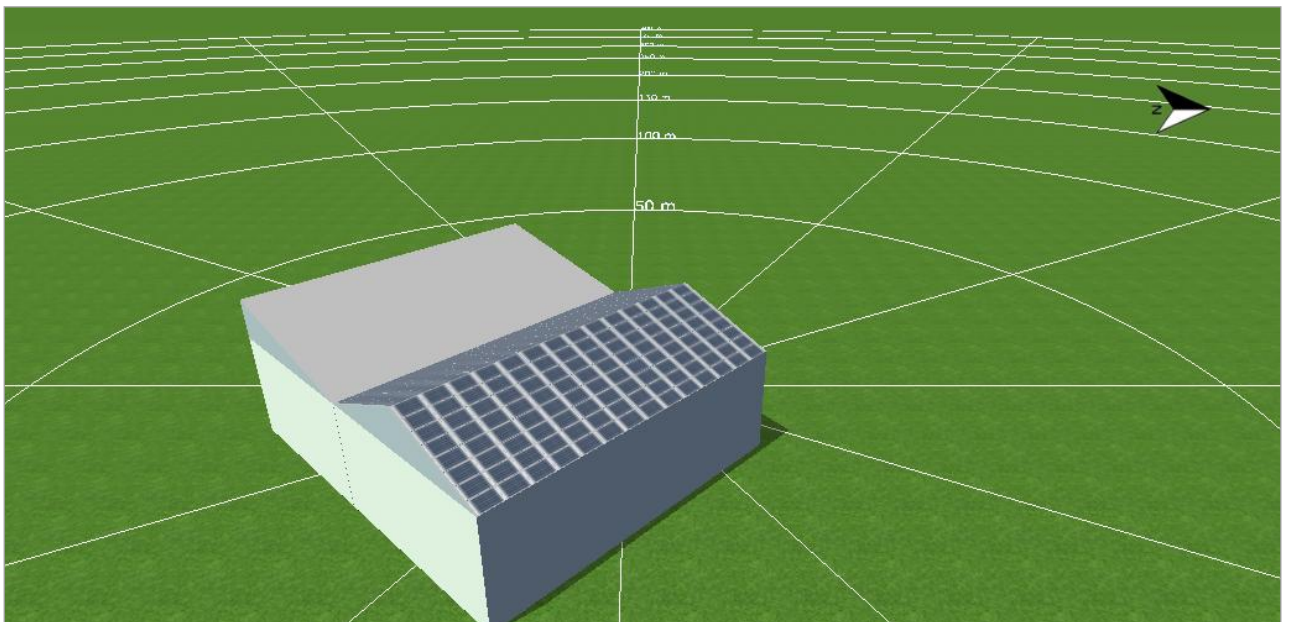


Figure: Screenshot02

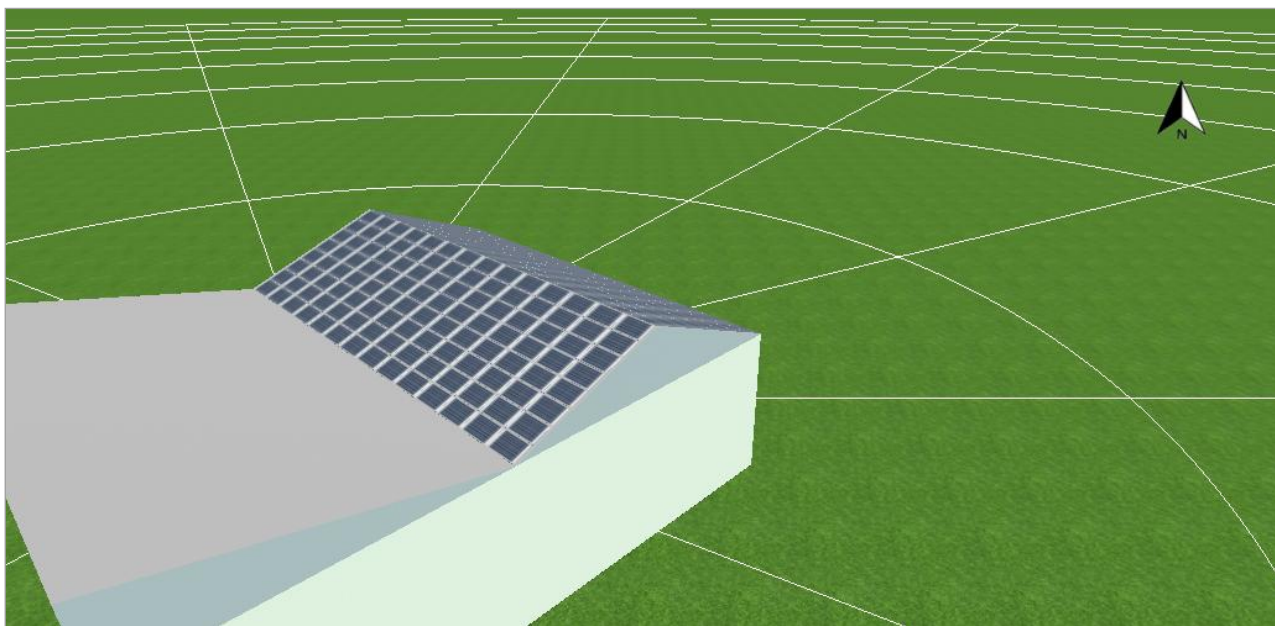


Figure: Screenshot03