

2021-01-27

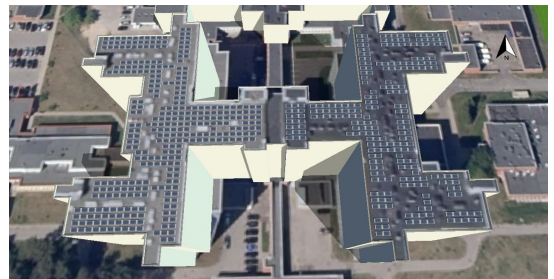
Documentation

Customer Details

Company	VšĮ Respublikinė Vilniaus universitetinė ligoninė
Customer Number	
Contact person	
Address	Šiltnamių g. 29, Vilnius
Phone	
Fax	
E-Mail	

Project Data

Project Name	
Offer no.	
Project Designer	
Address	Šiltnamių g. 29, Vilnius



Project Overview

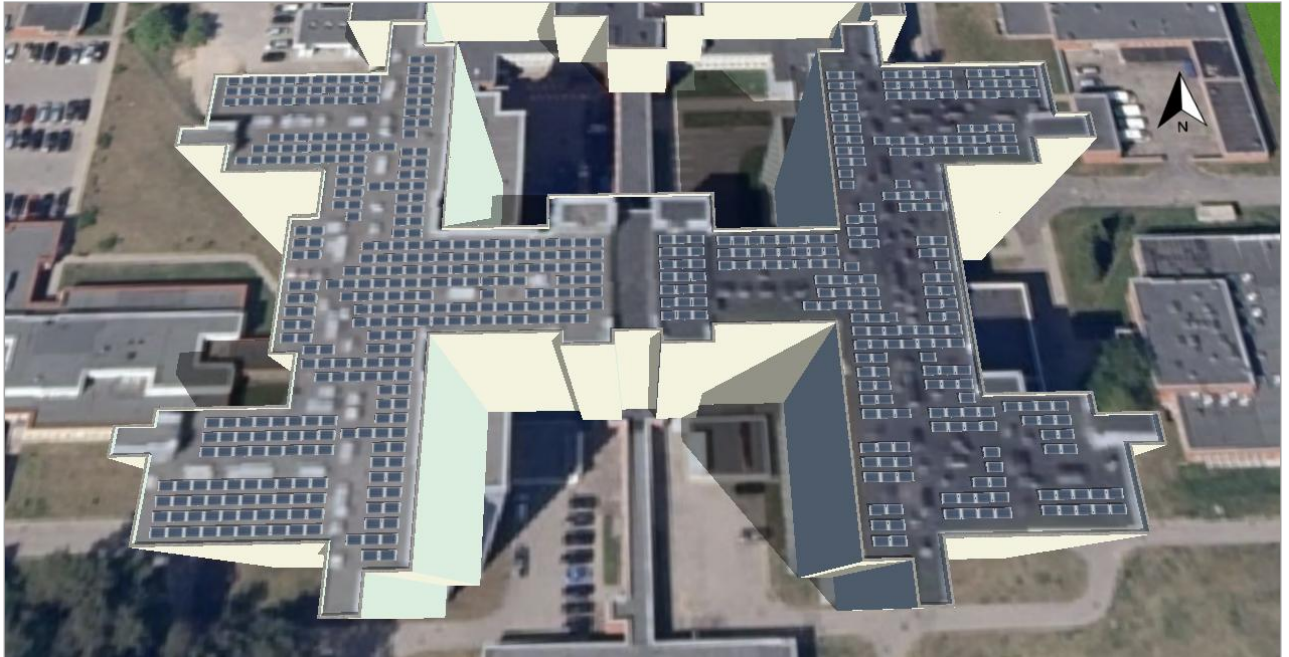


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System

Climate Data	Meteonorm, LTU (1991 - 2010)
PV Generator Output	221,25 kWp
PV Generator Surface	1 074,8 m ²
Number of PV Modules	590
Number of Inverters	2

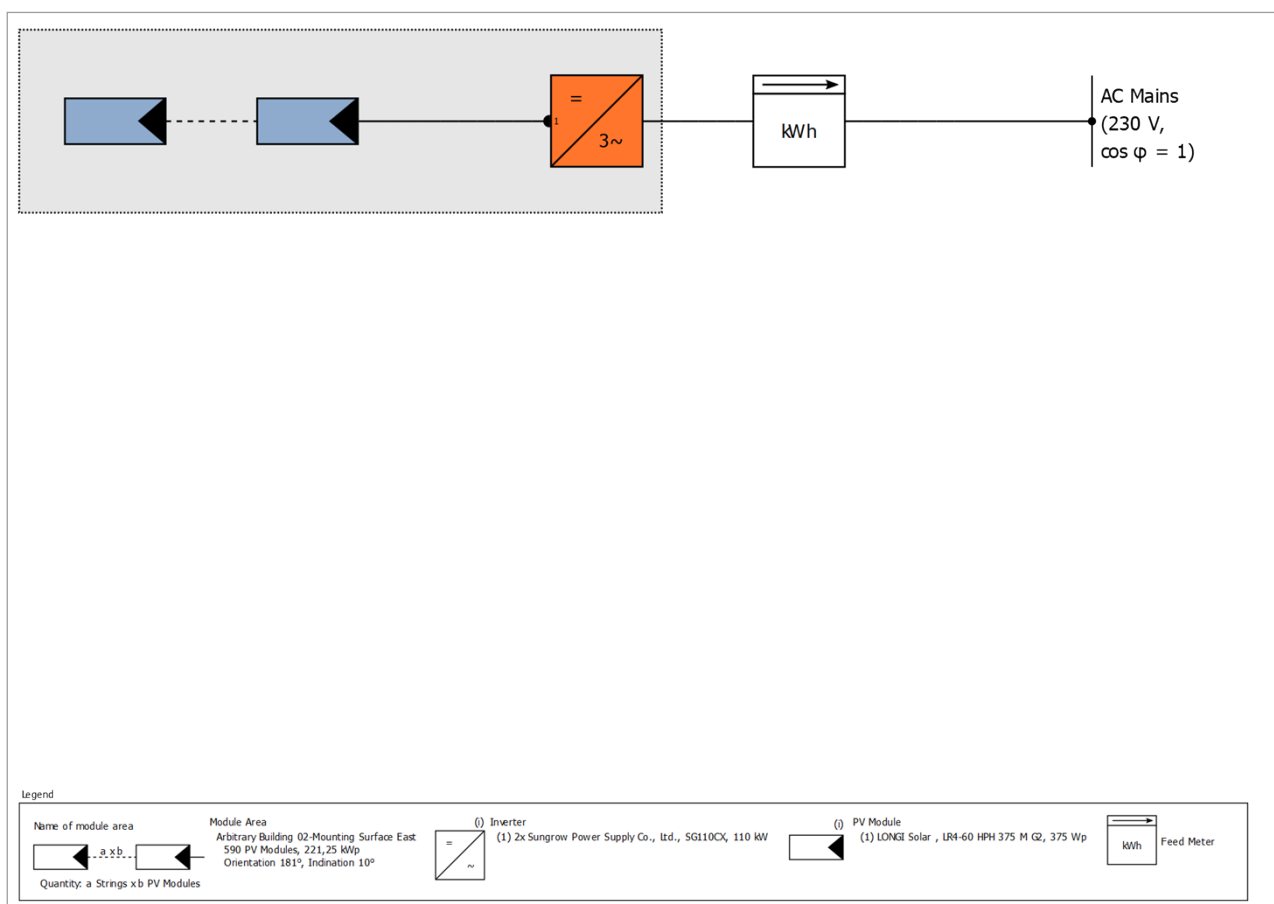


Figure: Schematic diagram

The yield

The yield

PV Generator Energy (AC grid)	198 982 kWh
Grid Feed-in	198 982 kWh
Down-regulation at Feed-in Point	0 kWh
Own Power Consumption	0,0 %
Solar Fraction	0,0 %
Spec. Annual Yield	899,35 kWh/kWp
Performance Ratio (PR)	83,0 %
Yield Reduction due to Shading	2,1 %/Year
CO ₂ Emissions avoided	93 522 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
Start of Operation	2021-01-27

Climate Data

Location	Meteonorm, LTU (1991 - 2010)
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 - Arbitrary Building 02-Mounting Surface East

PV Generator, 1. Module Area - Arbitrary Building 02-Mounting Surface East

Name	Arbitrary Building 02-Mounting Surface East
PV Modules	590 x LR4-60 HPH 375 M G2 (v3)
Manufacturer	LONGI Solar
Inclination	10 °
Orientation	South 181 °
Installation Type	Mounted - Roof
PV Generator Surface	1 074,8 m ²

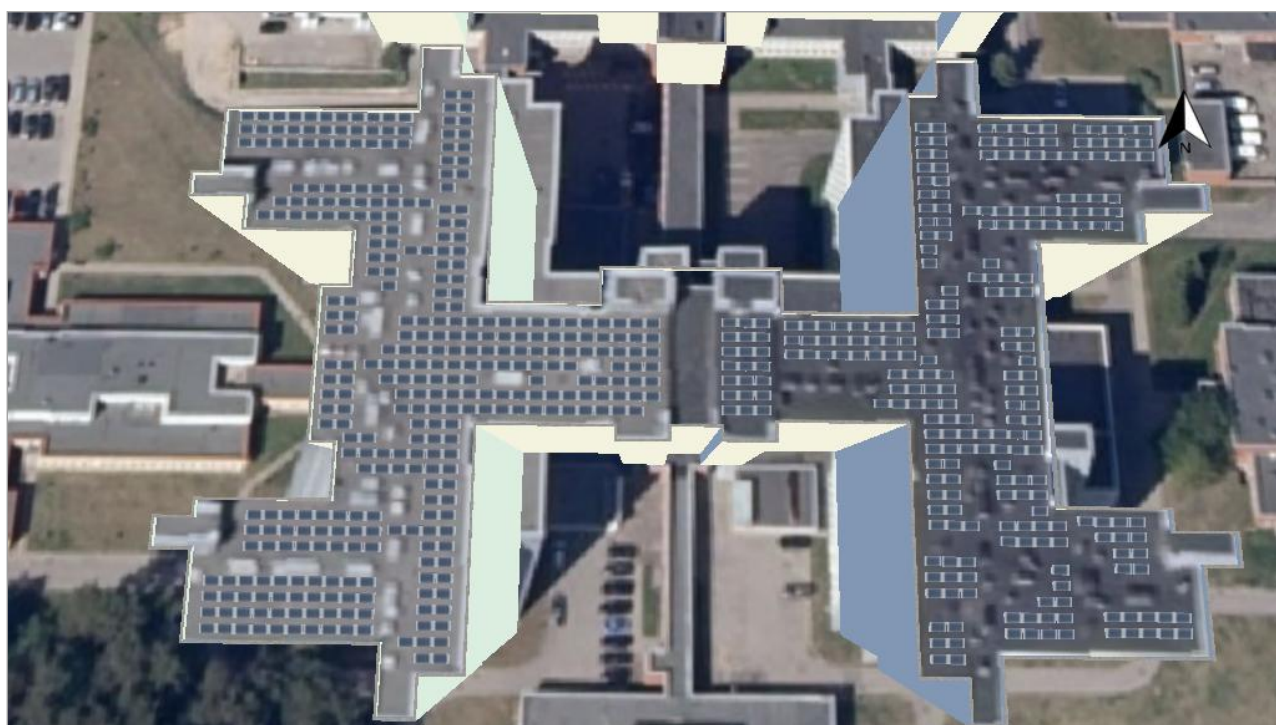


Figure: 1. Module Area - Arbitrary Building 02-Mounting Surface East

Inverter configuration

Configuration 1

Module Area	Arbitrary Building 02-Mounting Surface East
Inverter 1	
Model	SG110CX (v1)
Manufacturer	Sungrow Power Supply Co., Ltd.
Quantity	2
Sizing Factor	100,6 %
Configuration	MPP 1: 2 x 18
	MPP 2: 2 x 17
	MPP 3: 2 x 17
	MPP 4: 2 x 17
	MPP 5: 2 x 17
	MPP 6: 2 x 17
	MPP 7: 2 x 17
	MPP 8: 2 x 18
	MPP 9: 1 x 19

Simulation Results

Results Total System

PV System

PV Generator Output	221,3 kWp
Spec. Annual Yield	899,35 kWh/kWp
Performance Ratio (PR)	83,0 %
Yield Reduction due to Shading	2,1 %/Year
Grid Feed-in	198 982 kWh/Year
Grid Feed-in in the first year (incl. module degradation)	198 982 kWh/Year
Standby Consumption (Inverter)	17 kWh/Year
CO ₂ Emissions avoided	93 522 kg / year

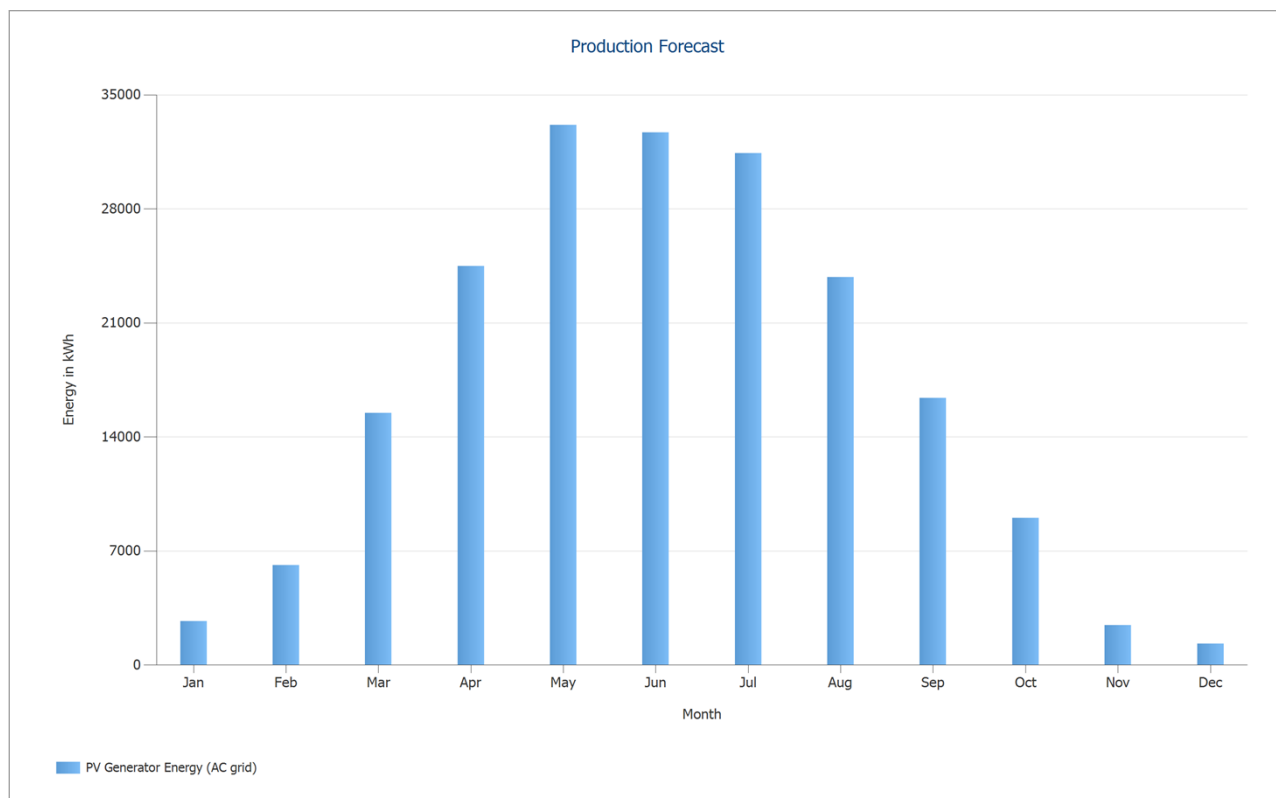


Figure: Production Forecast

PV System Energy Balance

PV System Energy Balance

Global radiation - horizontal	1 040,89 kWh/m²	
Deviation from standard spectrum	-26,02 kWh/m ²	-2,50 %
Ground Reflection (Albedo)	1,54 kWh/m ²	0,15 %
Orientation and inclination of the module surface	70,77 kWh/m ²	6,96 %
Module-independent shading	-4,06 kWh/m ²	-0,37 %
Reflection on the Module Interface	-6,80 kWh/m ²	-0,63 %
Global Radiation at the Module	1 076,31 kWh/m²	
	1 076,31 kWh/m ²	
	x 1074,797 m ²	
	= 1 156 816,11 kWh	
Global PV Radiation	1 156 816,11 kWh	
Soiling	-34 702,82 kWh	-3,00 %
STC Conversion (Rated Efficiency of Module 20,59 %)	-891 083,70 kWh	-79,41 %
Rated PV Energy	231 029,59 kWh	
Module-specific Partial Shading	-2 866,04 kWh	-1,24 %
Low-light performance	-3 733,31 kWh	-1,64 %
Deviation from the nominal module temperature	-1 324,69 kWh	-0,59 %
Diodes	-193,38 kWh	-0,09 %
Mismatch (Manufacturer Information)	-7 801,93 kWh	-3,50 %
Mismatch (Configuration/Shading)	-416,35 kWh	-0,19 %
PV Energy (DC) without inverter down-regulation	214 693,91 kWh	
Failing to reach the DC start output	0,00 kWh	0,00 %
Down-regulation on account of the MPP Voltage Range	-10,00 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	0,00 kWh	0,00 %
MPP Matching	-31,77 kWh	-0,01 %
PV energy (DC)	214 652,15 kWh	
Energy at the Inverter Input	214 652,15 kWh	
Input voltage deviates from rated voltage	-14,02 kWh	-0,01 %
DC/AC Conversion	-5 183,28 kWh	-2,41 %
Standby Consumption (Inverter)	-17,12 kWh	-0,01 %
Total Cable Losses	-10 473,64 kWh	-5,00 %
PV energy (AC) minus standby use	198 964,08 kWh	
Grid Feed-in	198 982,10 kWh	

Data Sheets

PV Module Data Sheet

PV Module: LR4-60 HPH 375 M G2 (v3)

Manufacturer	LONGI Solar
Available	Yes

Electrical Data

Cell Type	Si monocrystalline
Only Transformer Inverters suitable	No
Cell Count	120
Number of Bypass Diodes	3
Half-cell module	Yes

Mechanical Data

Width	1038 mm
Height	1755 mm
Depth	35 mm
Frame Width	30 mm
Weight	19,5 kg

I/V Characteristics at STC

MPP Voltage	34,6 V
MPP Current	10,84 A
Nominal output	375 W
Efficiency	20,59 %
Open Circuit Voltage	41,1 V
Short-Circuit Current	11,6 A
Fill Factor	78,67 %
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	33,218 V
Current in MPP at Part Load	2,206 A
Open Circuit Voltage (Part Load)	38,518 V
Short Circuit Current at Part Load	2,359 A

Further

Voltage Coefficient	-111 mV/K
Electricity Coefficient	5,6 mA/K
Output Coefficient	-0,35 %/K
Incident Angle Modifier	100 %
Maximum System Voltage	1500 V

Inverter Data Sheet

Inverter: SG110CX (v1)

Manufacturer	Sungrow Power Supply Co., Ltd.
Available	Yes
Electrical Data	
DC nominal output	110 kW
AC Power Rating	110 kW
Max. DC Power	165 kW
Max. AC Power	110 kVA
Standby Consumption	2 W
Night Consumption	2 W
Min. Feed-in Power	2 W
Max. Input Current	234 A
Max. Input Voltage	1100 V
Nom. DC Voltage	585 V
Number of Phases	3
Number of DC Inlets	18
With Transformer	No
Change in Efficiency when Input Voltage deviates from Rated Voltage	0,02 %/100V
MPP Tracker	
Output Range < 20% of Power Rating	99,9 %
Output Range > 20% of Power Rating	100 %
Count of MPP Trackers	9
Max. Input Current	26 A
Max. Input Power	22,1 kW
Min. MPP Voltage	200 V
Max. MPP Voltage	1000 V

Plans and parts list

Circuit Diagram

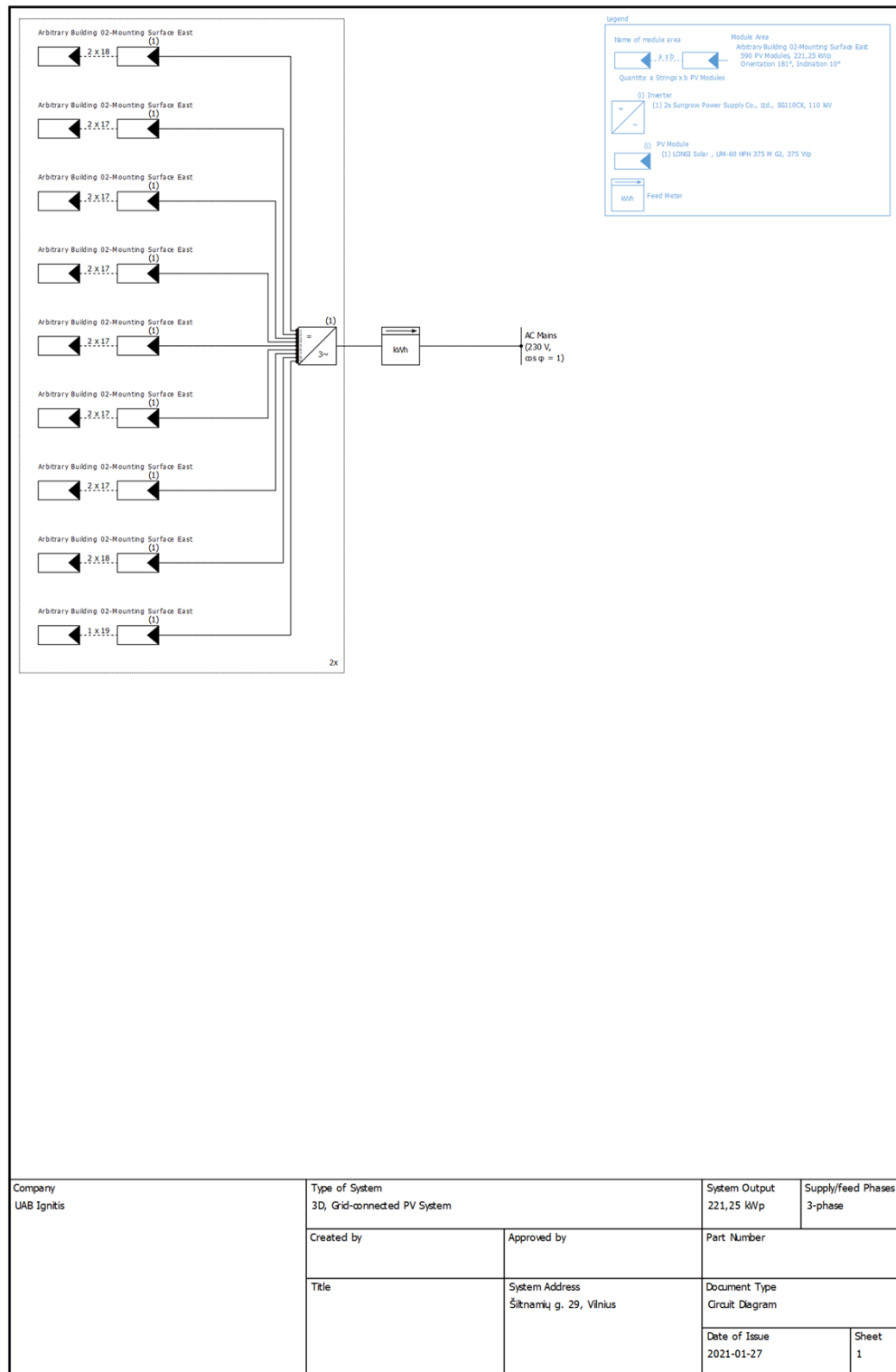


Figure: Circuit Diagram

Dimensioning Plan

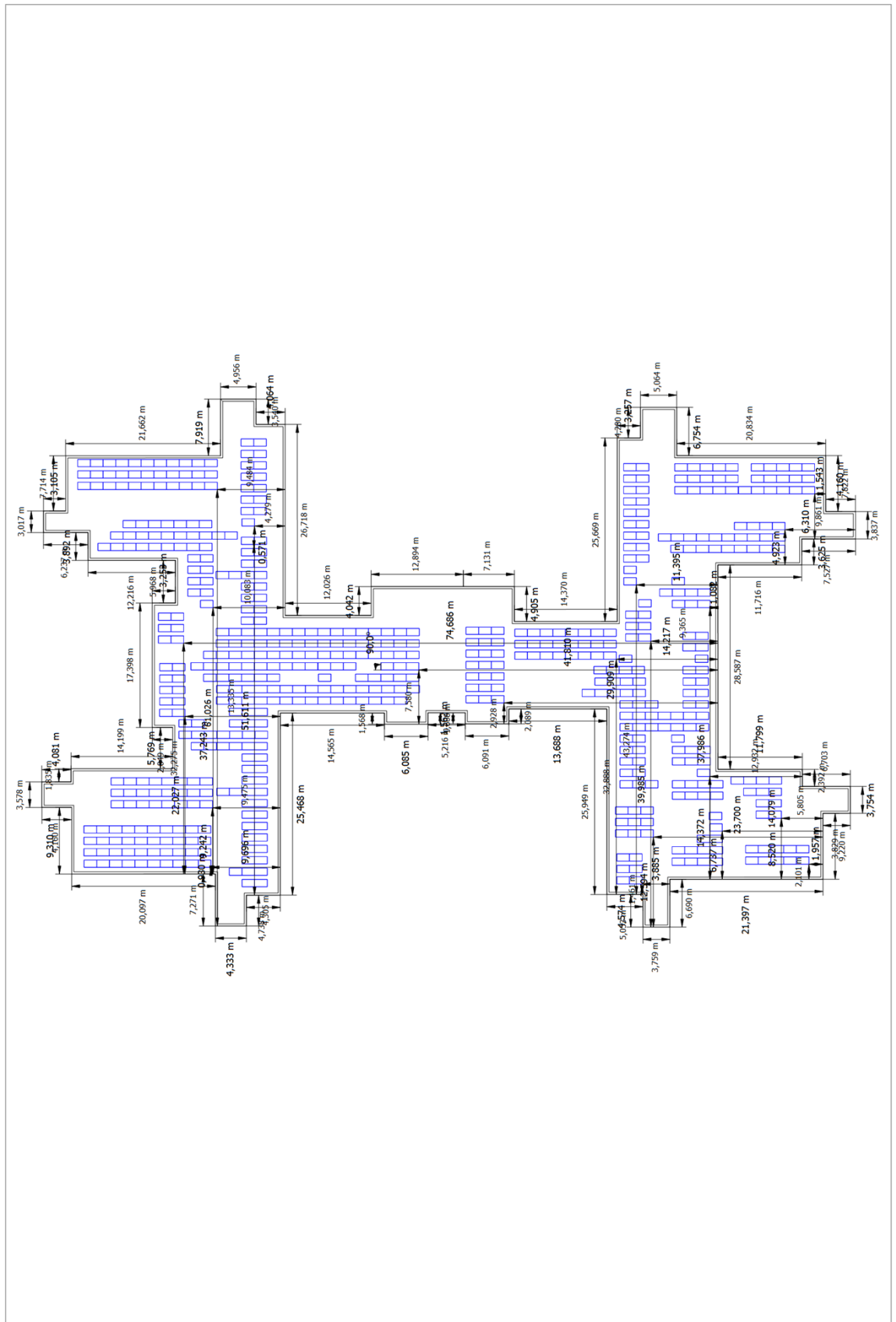


Figure: Arbitrary Building 02-Mounting Surface East

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		LONGI Solar	LR4-60 HPH 375 M G2	590	Piece
2	Inverter		Sungrow Power Supply Co., Ltd.	SG110CX	2	Piece
3	Meter			Feed Meter	1	Piece

Screenshots, 3D Design

Module Areas

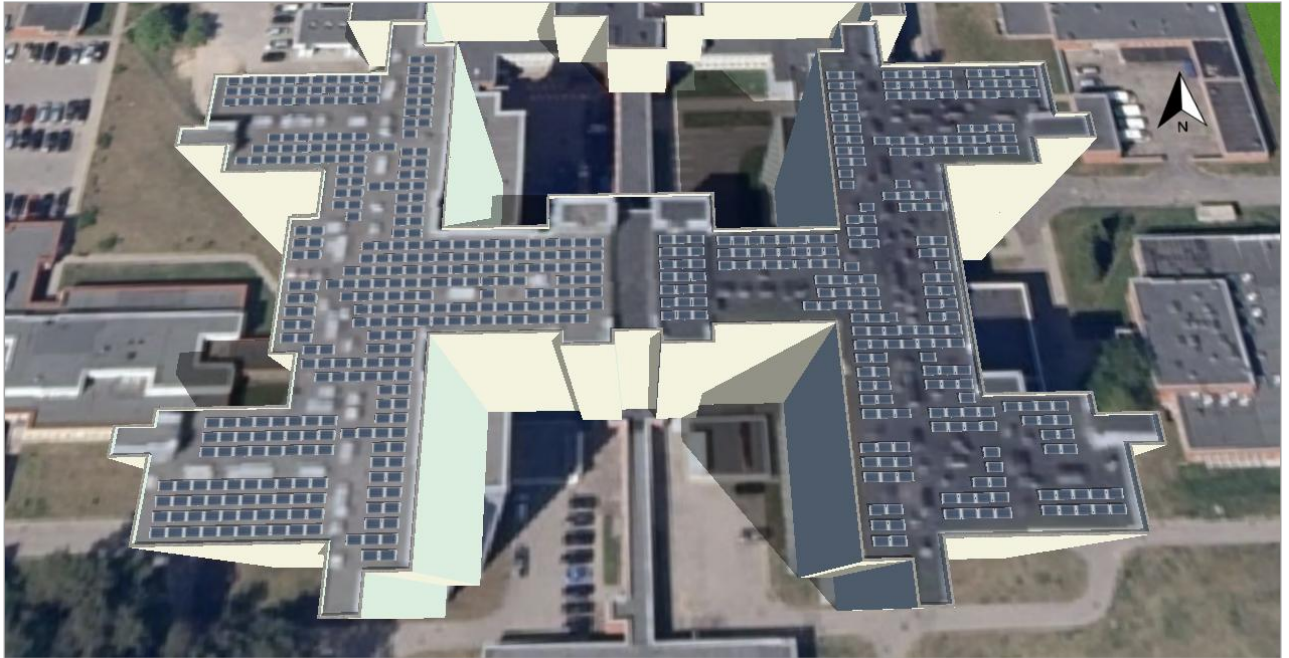


Figure: Screenshot01