

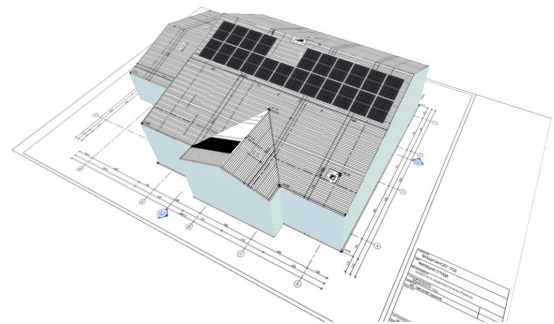
кв. Глазне,
2770 Банско

7.10.2024 г.

Your PV system

Address of Installation

41°49'47.4"N 23°28'15.7"E



Project Description:
PV-Report



Project Overview

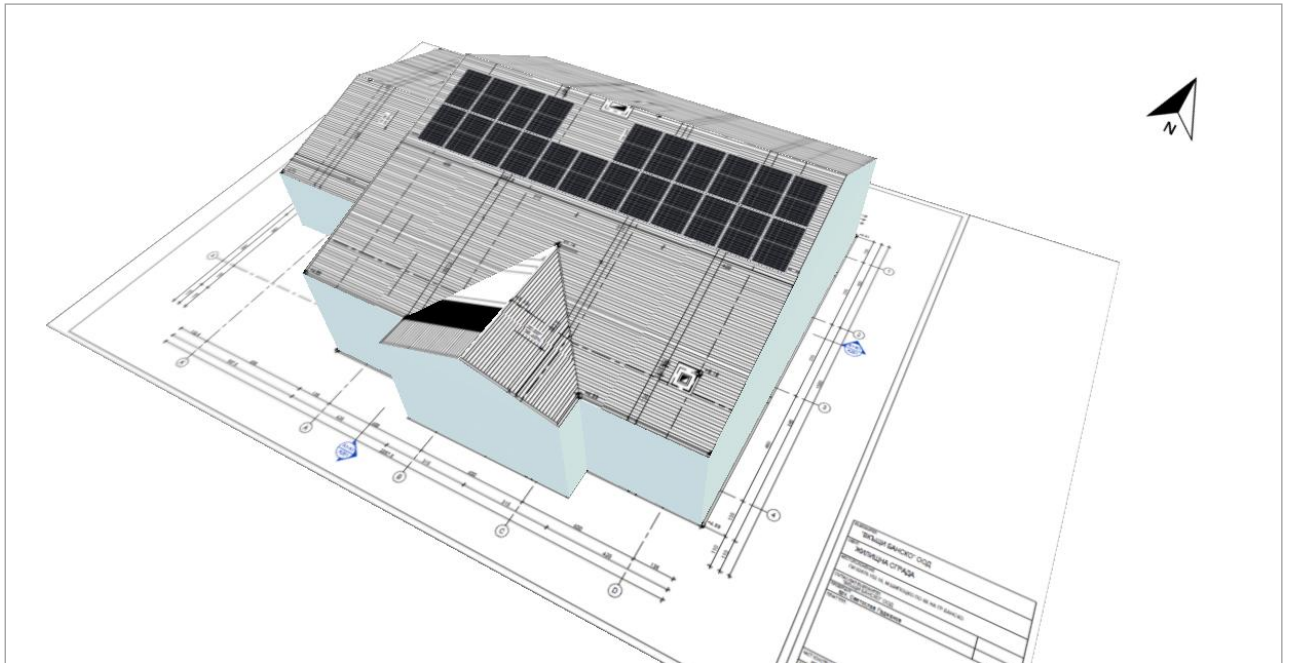


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances and Battery Systems

Climate Data	Bansko, BGR (2001 - 2020)
Values source	Meteonorm 8.2(i)
PV Generator Output	9.02 kWp
PV Generator Surface	42.6 m ²
Number of PV Modules	22
Number of Inverters	1
No. of battery systems	1

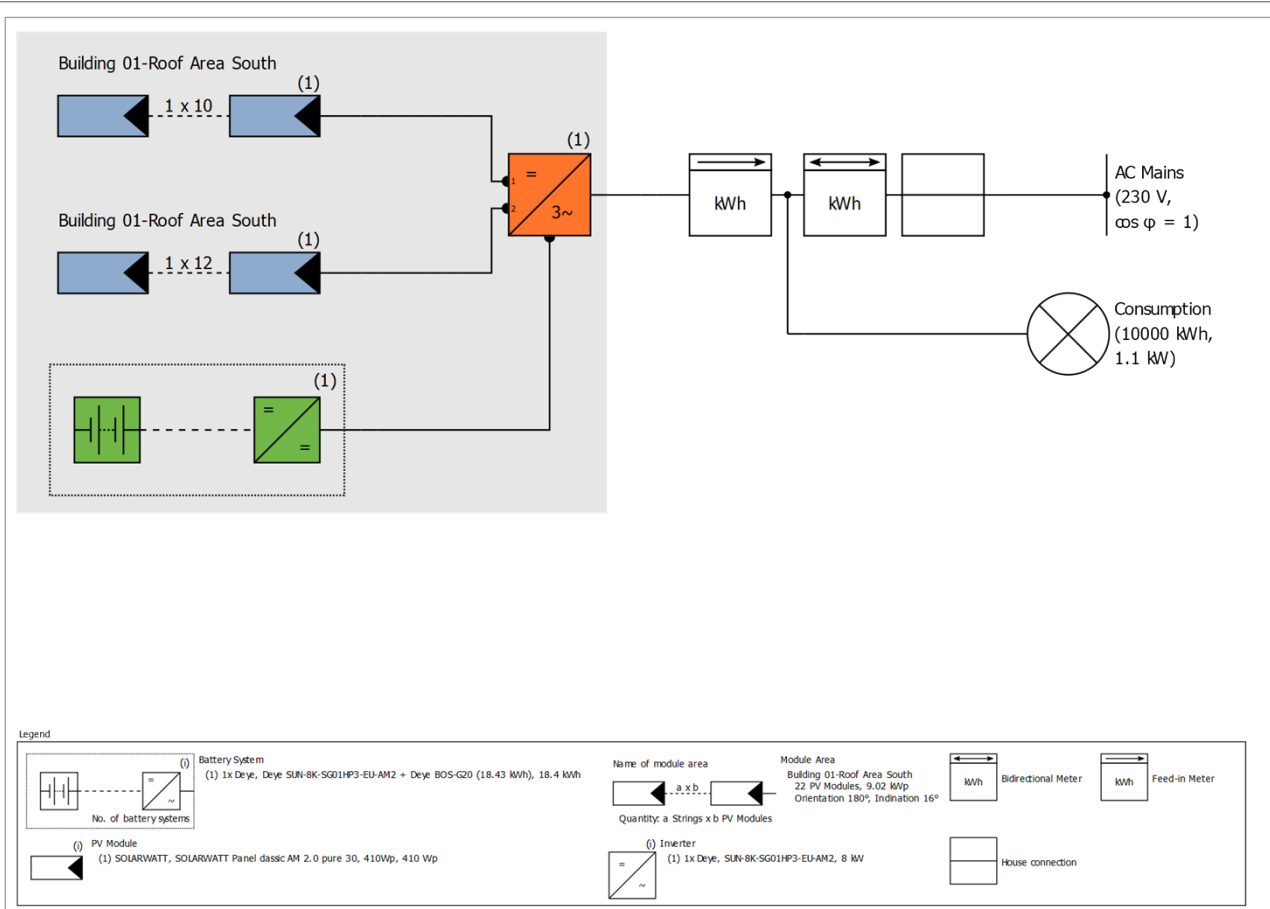


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	9.02 kWp
Spec. Annual Yield	1 433.57 kWh/kWp
Performance Ratio (PR)	84.03 %
Yield Reduction due to Shading	0.0 %
PV Generator Energy (AC grid) with battery	12 447 kWh/Year
Direct Own Use	8 554 kWh/Year
Clipping at Feed-in Point	3 893 kWh/Year
Grid Export	0 kWh/Year
Own Power Consumption	68.7 %
CO ₂ Emissions avoided	3 781 kg / year
Level of Self-sufficiency	85.5 %

Financial Analysis

Your Gain

Total investment costs	21 540.55 €
Internal Rate of Return (IRR)	10.64 %
Amortization Period	10.3 Years
Electricity Production Costs	0.1186 €/kWh
Energy Balance/Feed-in Concept	Surplus 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 with Electrical Appliances and Battery Systems
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Climate Data

Location	Bansko, BGR (2001 - 2020)
Values source	Meteonorm 8.2(i)
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Consumption

Total Consumption	10000 kWh
New	10000 kWh
Load Peak	1.1 kW

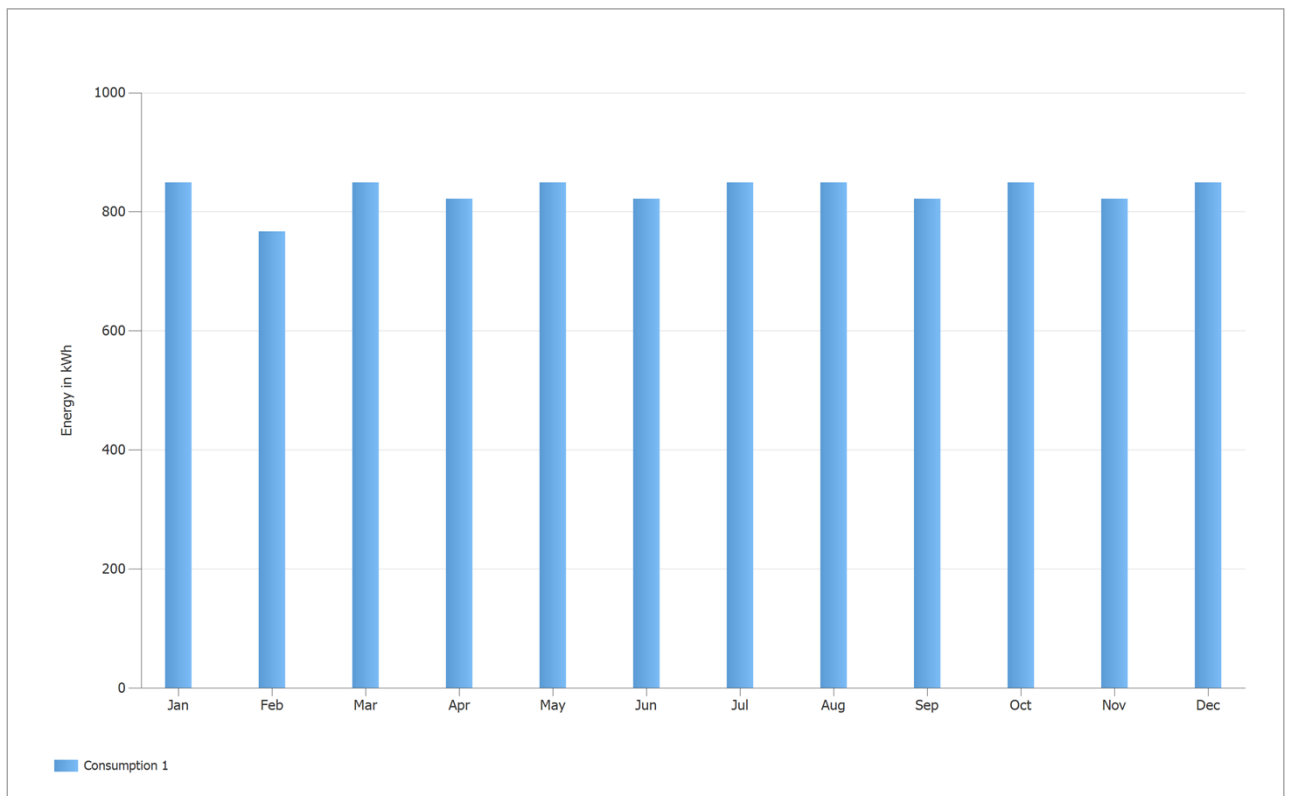


Figure: Consumption

Module Areas

1. Module Area - Building 01-Roof Area South

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

Name	Building 01-Roof Area South
PV Modules	22 x SOLARWATT Panel classic AM 2.0 pure 30, 410Wp (v1)
Manufacturer	SOLARWATT
Inclination	16 °
Orientation	South 180 °
Installation Type	Roof parallel
PV Generator Surface	42.6 m ²

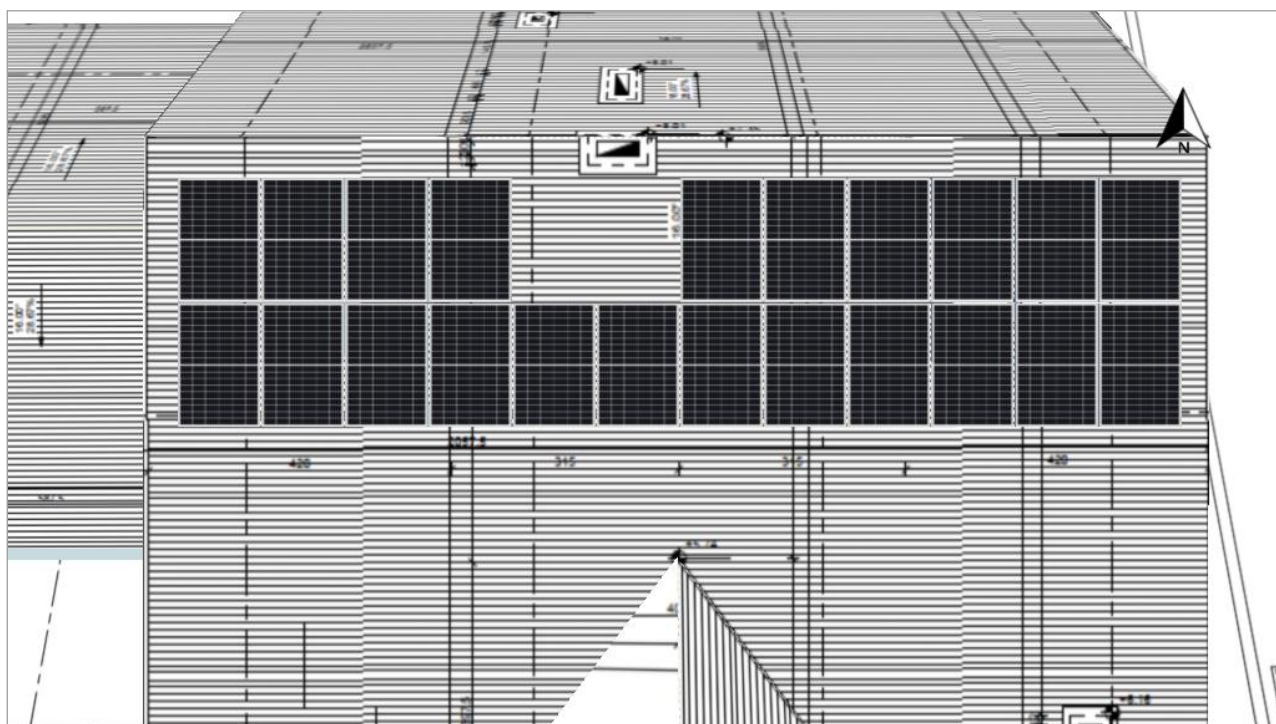


Figure: 1. Module Area - Building 01-Roof Area South

Horizon Line, 3D Design

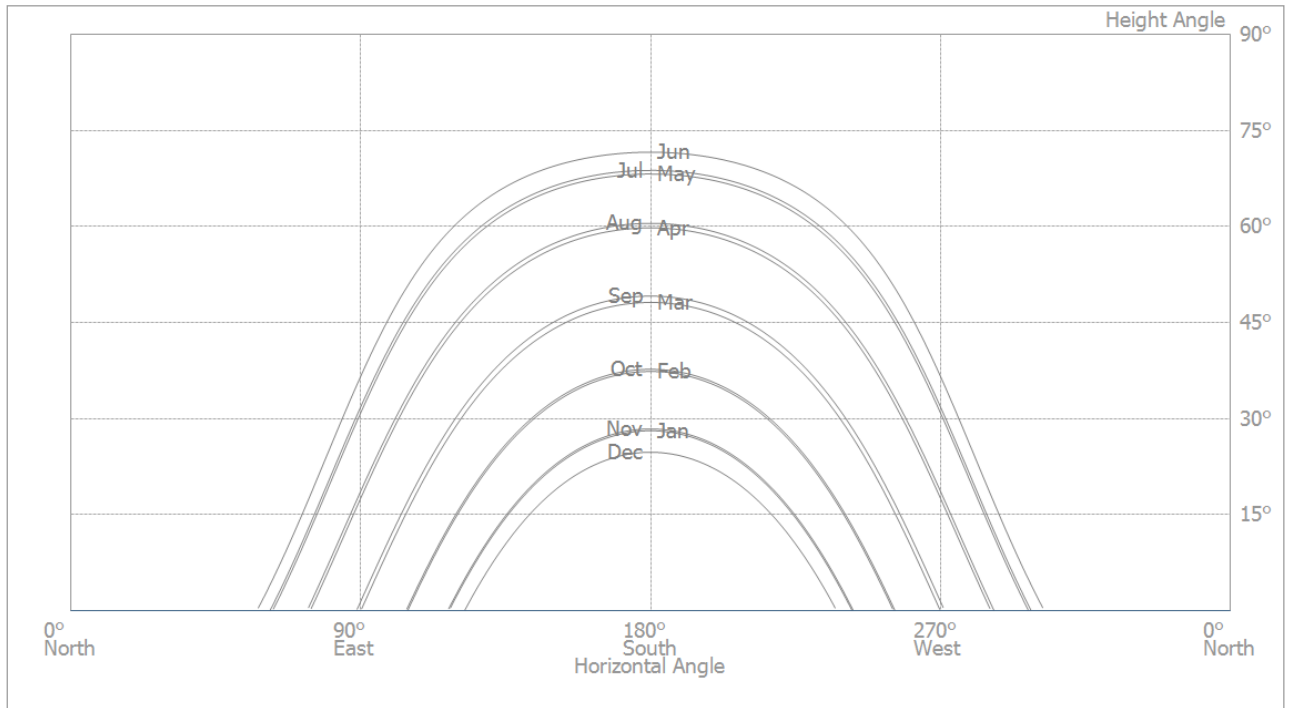


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Area	Building 01-Roof Area South
Inverter 1	
Model	SUN-8K-SG01HP3-EU-AM2 (v1)
Manufacturer	Deye
Quantity	1
Sizing Factor	112.8 %
Configuration	MPP 1: 1 x 10 MPP 2: 1 x 12

AC Mains

AC Mains

Number of Phases	3
Mains voltage between phase and neutral	230 V
Displacement Power Factor (cos phi)	+/- 1
Limitation of the Feed-in Power in percent of the DC Power	0 %

Battery Systems

Battery System - Group 1

Model	Deye SUN-8K-SG01HP3-EU-AM2 + Deye BOS-G20 (18.43 kWh) (v1)
Manufacturer	Deye
Quantity	1
Battery Inverter	
Type of Coupling	DC intermediate circuit coupling
Nominal output	8 kW
Battery	
Manufacturer	Deye
Model	BOS-G (v2)
Quantity	4
Battery Energy	18.4 kWh
Battery Type	Lithium iron phosphate

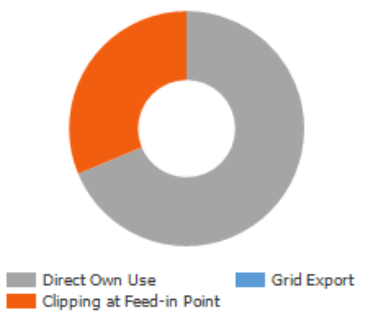
Simulation Results

Results Total System

PV System

PV Generator Output	9.02 kWp
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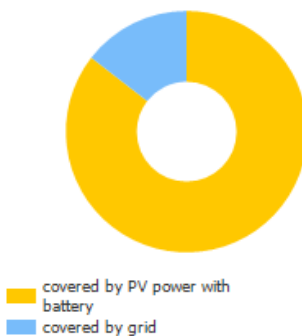
PV Generator Energy (AC grid) with battery



Appliances

Appliances	10 000 kWh/Year
Standby Consumption (Inverter)	4 kWh/Year
Total Consumption	10 004 kWh/Year
covered by PV power with battery	8 554 kWh/Year
covered by grid	1 450 kWh/Year
Solar Fraction	85.5 %

Total Consumption



Battery System

Charge at beginning	18 kWh
Battery Charge (PV System)	5 442 kWh/Year
Battery Energy for the Covering of Consumption	4 955 kWh/Year
Battery discharge into the grid	0 kWh/Year
Losses due to charging/discharging	480 kWh/Year
Losses in Battery	26 kWh/Year
Cycle Load	24.5 %
Service Life	4 Years

Level of Self-sufficiency

Total Consumption	10 004 kWh/Year
covered by grid	1 450 kWh/Year
Level of Self-sufficiency	85.5 %

Energy Flow Graph

Project: Bansko

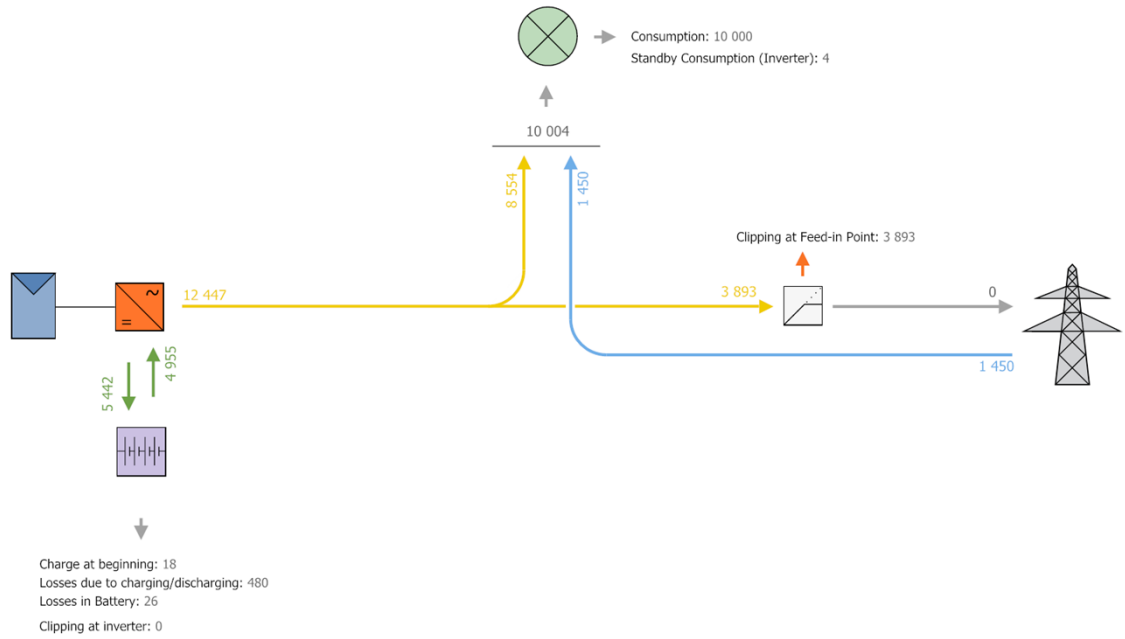


Figure: Energy flow

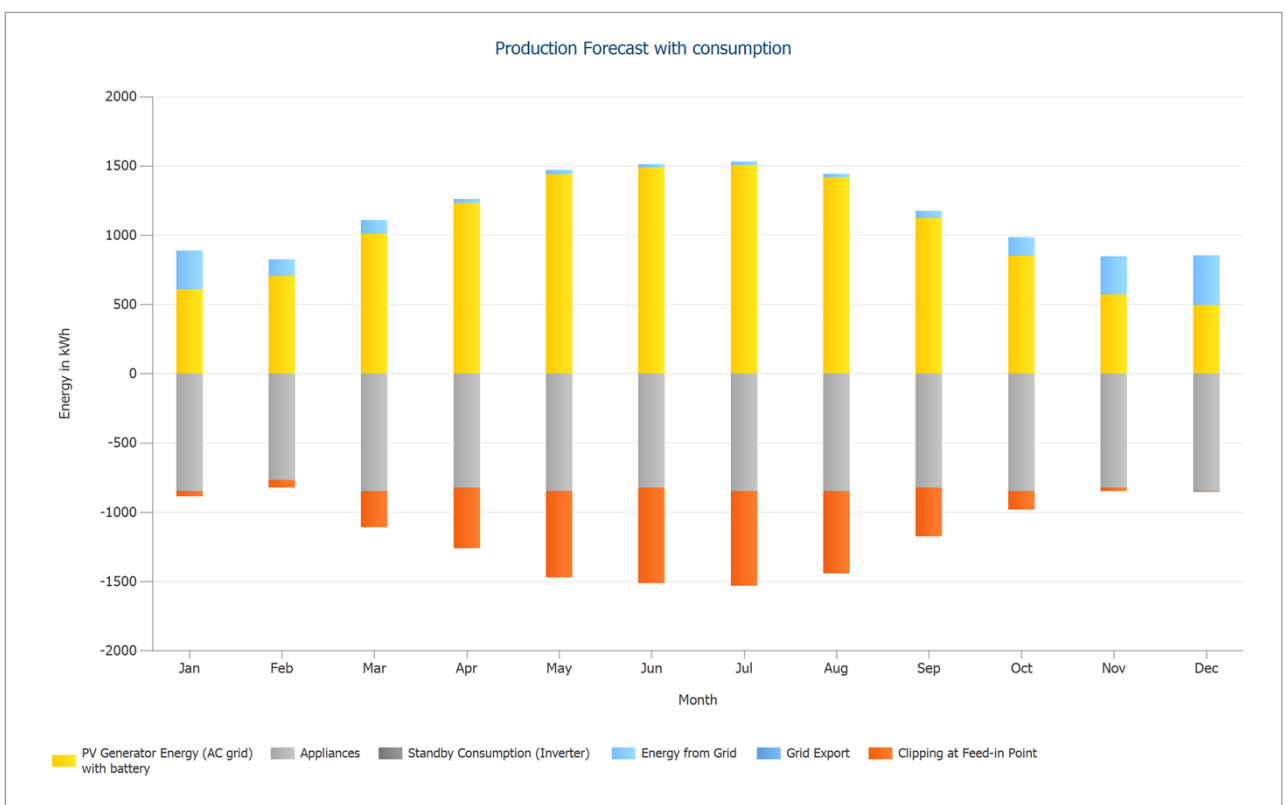


Figure: Production Forecast with consumption

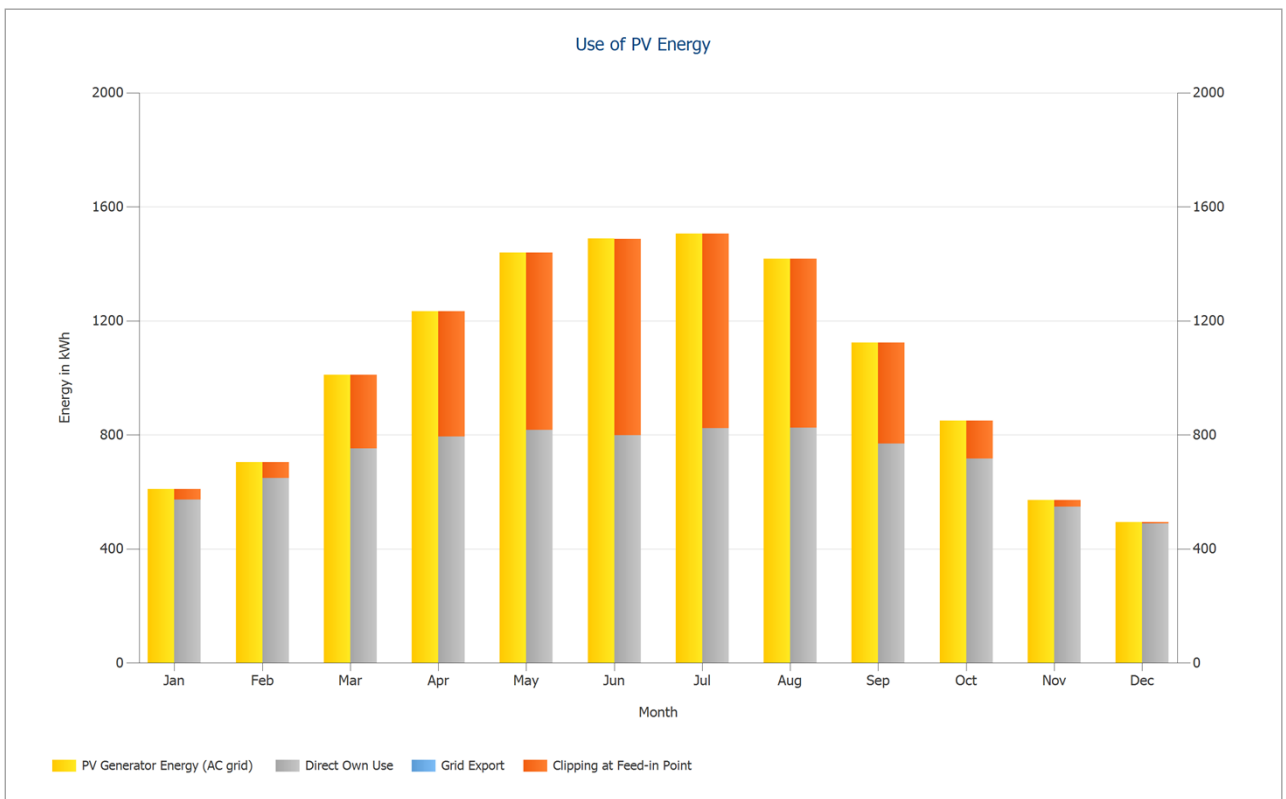


Figure: Use of PV Energy

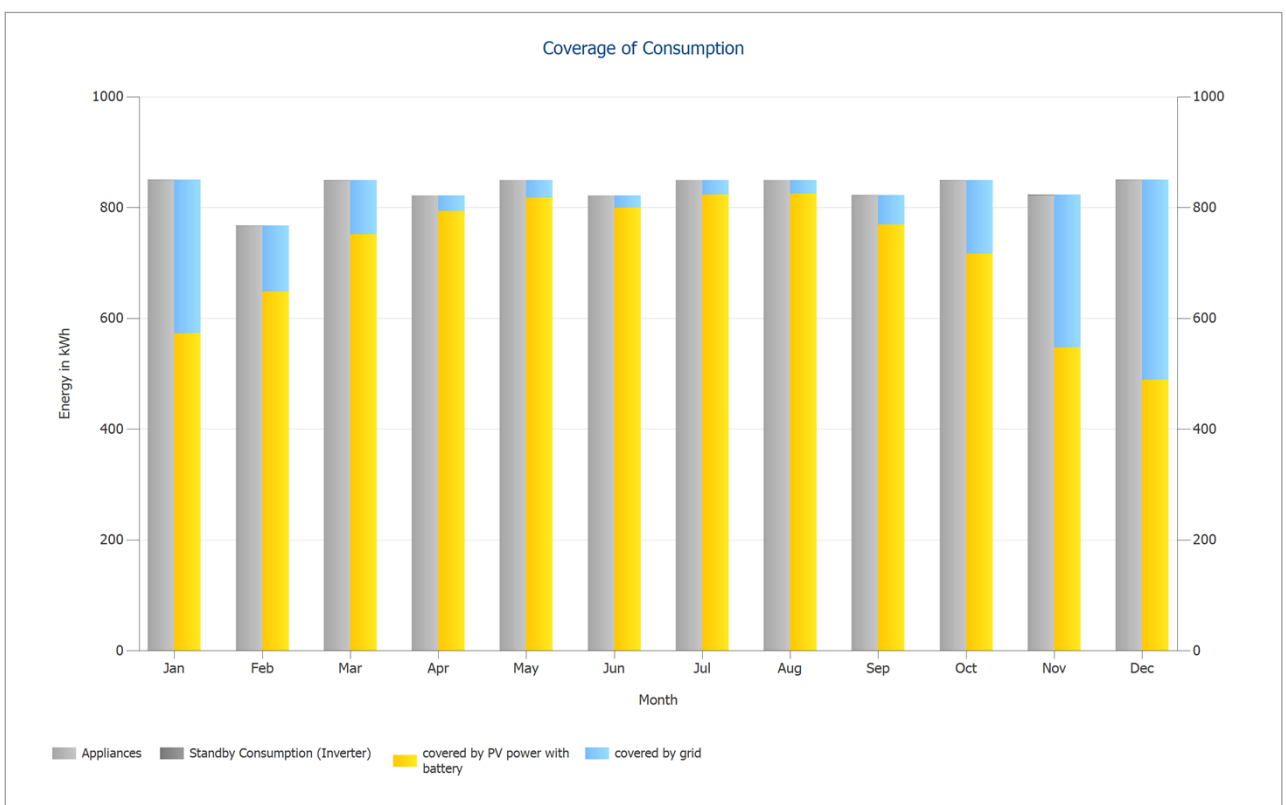


Figure: Coverage of Consumption

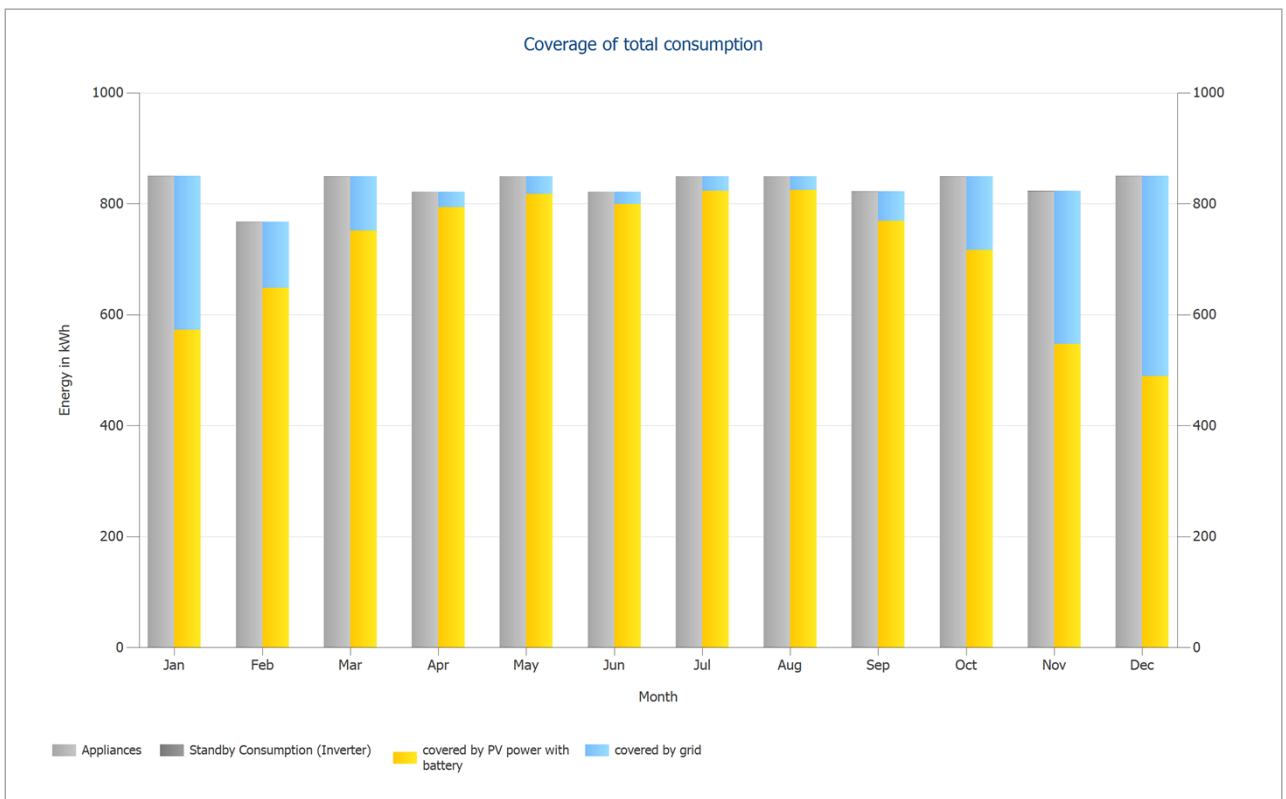


Figure: Coverage of total consumption

Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	0 kWh/Year
PV Generator Output	9 kWp
Start of Operation of the System	18.9.2024 r.
Assessment Period	24 Years
Interest on Capital	1 %

Economic Parameters

Internal Rate of Return (IRR)	10.64 %
Accrued Cash Flow (Cash Balance)	42 764.84 €
Amortization Period	10.3 Years
Electricity Production Costs	0.1186 €/kWh

Payment Overview

Specific Investment Costs	2 388.09 €/kWp
Investment Costs	21 540.55 €
One-off Payments	0.00 €
Incoming Subsidies	0.00 €
Annual Costs	0.00 €/Year
Other Revenue or Savings	0.00 €/Year

Remuneration and Savings

Total Payment from Utility in First Year	0.00 €/Year
First year savings	1 865.46 €/Year

Electrohold Tariff (Example)

Energy Price	0.22 €/kWh
Inflation Rate for Energy Price	5 %/Year

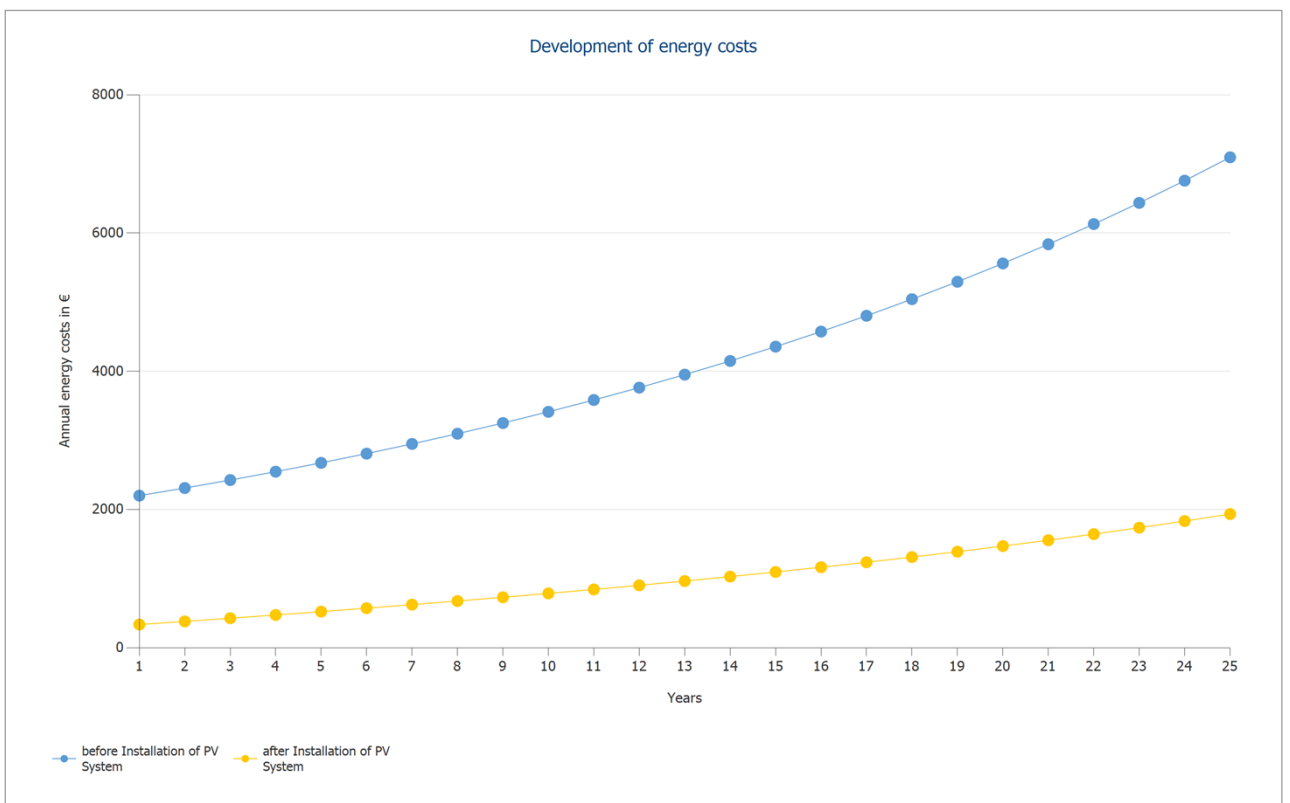


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
Investments	-21 540.55 €	0.00 €	0.00 €	0.00 €	0.00 €
Electricity Savings	1 776.53 €	1 892.04 €	1 940.49 €	1 992.37 €	2 047.74 €
Annual Cash Flow	-19 764.02 €	1 892.04 €	1 940.49 €	1 992.37 €	2 047.74 €
Accrued Cash Flow (Cash Balance)	-19 764.02 €	-17 871.97 €	-15 931.48 €	-13 939.11 €	-11 891.37 €

Cash flow

	Year 6	Year 7	Year 8	Year 9	Year 10
Investments	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €
Electricity Savings	2 106.64 €	2 169.15 €	2 235.33 €	2 305.27 €	2 379.04 €
Annual Cash Flow	2 106.64 €	2 169.15 €	2 235.33 €	2 305.27 €	2 379.04 €
Accrued Cash Flow (Cash Balance)	-9 784.73 €	-7 615.58 €	-5 380.24 €	-3 074.98 €	-695.94 €

Cash flow

	Year 11	Year 12	Year 13	Year 14	Year 15
Investments	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €
Electricity Savings	2 456.73 €	2 538.44 €	2 624.29 €	2 714.37 €	2 808.82 €
Annual Cash Flow	2 456.73 €	2 538.44 €	2 624.29 €	2 714.37 €	2 808.82 €
Accrued Cash Flow (Cash Balance)	1 760.79 €	4 299.23 €	6 923.52 €	9 637.90 €	12 446.72 €

Cash flow

	Year 16	Year 17	Year 18	Year 19	Year 20
Investments	0.00 €	0.00 €	0.00 €	0.00 €	0.00 €
Electricity Savings	2 907.75 €	3 011.31 €	3 119.63 €	3 232.87 €	3 351.18 €
Annual Cash Flow	2 907.75 €	3 011.31 €	3 119.63 €	3 232.87 €	3 351.18 €
Accrued Cash Flow (Cash Balance)	15 354.47 €	18 365.78 €	21 485.41 €	24 718.27 €	28 069.46 €

Cash flow

	Year 21	Year 22	Year 23	Year 24
Investments	0.00 €	0.00 €	0.00 €	0.00 €
Electricity Savings	3 474.74 €	3 603.71 €	3 738.28 €	3 878.66 €
Annual Cash Flow	3 474.74 €	3 603.71 €	3 738.28 €	3 878.66 €
Accrued Cash Flow (Cash Balance)	31 544.19 €	35 147.90 €	38 886.19 €	42 764.84 €

Degradation and inflation rates are applied on a monthly basis over the entire observation period. This is done in the first year.

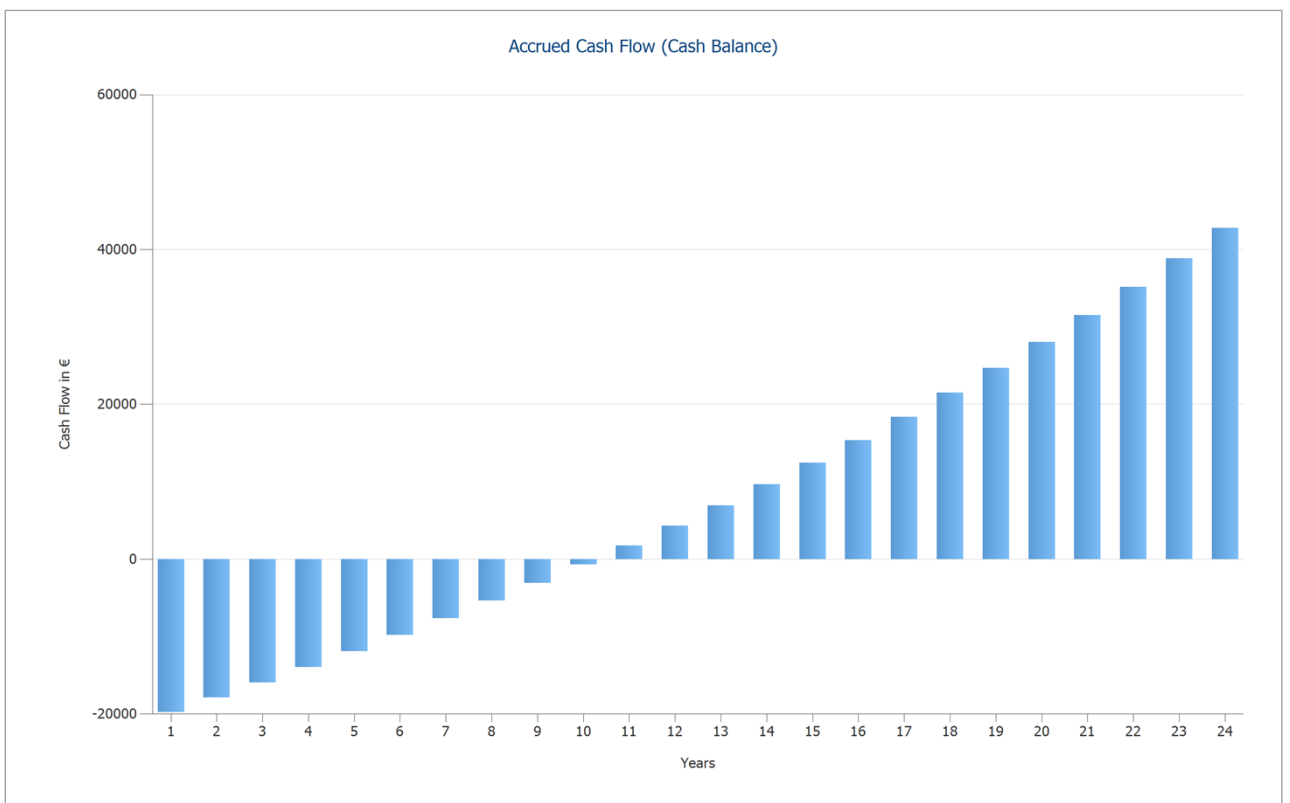


Figure: Accrued Cash Flow (Cash Balance)

Data Sheets

PV Module Data Sheet

PV Module: SOLARWATT Panel classic AM 2.0 pure 30, 410Wp (v1)

Manufacturer	SOLARWATT
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	0.55 V
Integrated power optimizer	No
Only Transformer Inverters suitable	No

I/V Characteristics at STC

MPP Voltage	31.1 V
MPP Current	13.2 A
Open Circuit Voltage	37.3 V
Short-Circuit Current	14.1 A
Increase open circuit voltage before stabilisation	0 %
Nominal output	410 W
Fill Factor	78.06 %
Efficiency	21.19 %

I/V Part Load Characteristics

Values source	Manufacturer/user-created
Irradiance	200 W/m ²
Voltage in MPP at Part Load	30.01 V
Current in MPP at Part Load	2.69 A
Open Circuit Voltage (Part Load)	34.98 V
Short Circuit Current at Part Load	2.79 A

Additional Parameters

Temperature Coefficient of Voc	-93.2 mV/K
Temperature Coefficient of Isc	7.1 mA/K
Temperature Coefficient of Pmpp	-0.33 %/K
Incident Angle Modifier (IAM)	100 %
Maximum System Voltage	1000 V

Mechanical Data

Width	1134 mm
Height	1708 mm
Depth	30 mm
Frame Width	11 mm
Weight	19.5 kg

Inverter Data Sheet

Inverter: SUN-8K-SG01HP3-EU-AM2 (v1)

Manufacturer	Deye
Available	Yes

Electrical data - DC

DC nominal output	8 kW
Max. DC Power	10.4 kW
Nom. DC Voltage	600 V
Max. Input Voltage	1000 V
Max. Input Current	40 A
Max. short circuit current	60 A
Number of DC Inlets	2

Electrical data - AC

AC Power Rating	8 kW
Max. AC Power	8.8 kVA
Nom. AC Voltage	400 V
Number of Phases	3
With Transformer	No

Electrical data - other

Change in Efficiency when Input Voltage deviates from Rated Voltage	1 %/100V
Min. Feed-in Power	30 W
Standby Consumption	5 W
Night Consumption	5 W

MPP Tracker

Output Range < 20% of Power Rating	93.5 %
Output Range > 20% of Power Rating	96 %
Count of MPP Trackers	2

MPP Tracker 1-2

Max. Input Current	20 A
Max. short circuit current	30 A
Max. Input Power	5.2 kW
Min. MPP Voltage	150 V
Max. MPP Voltage	850 V

Plans and parts list

Circuit Diagram

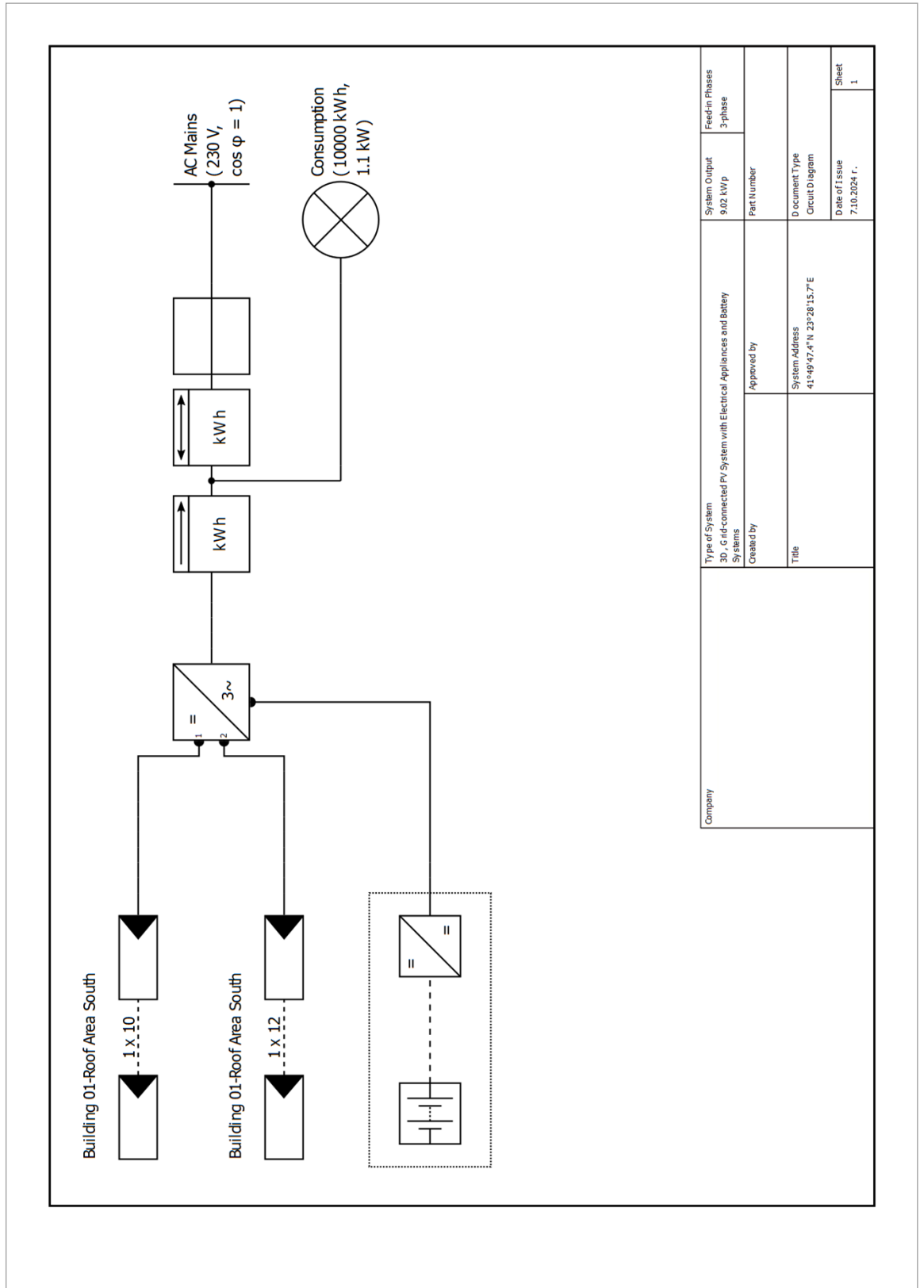


Figure: Circuit Diagram

Overview plan

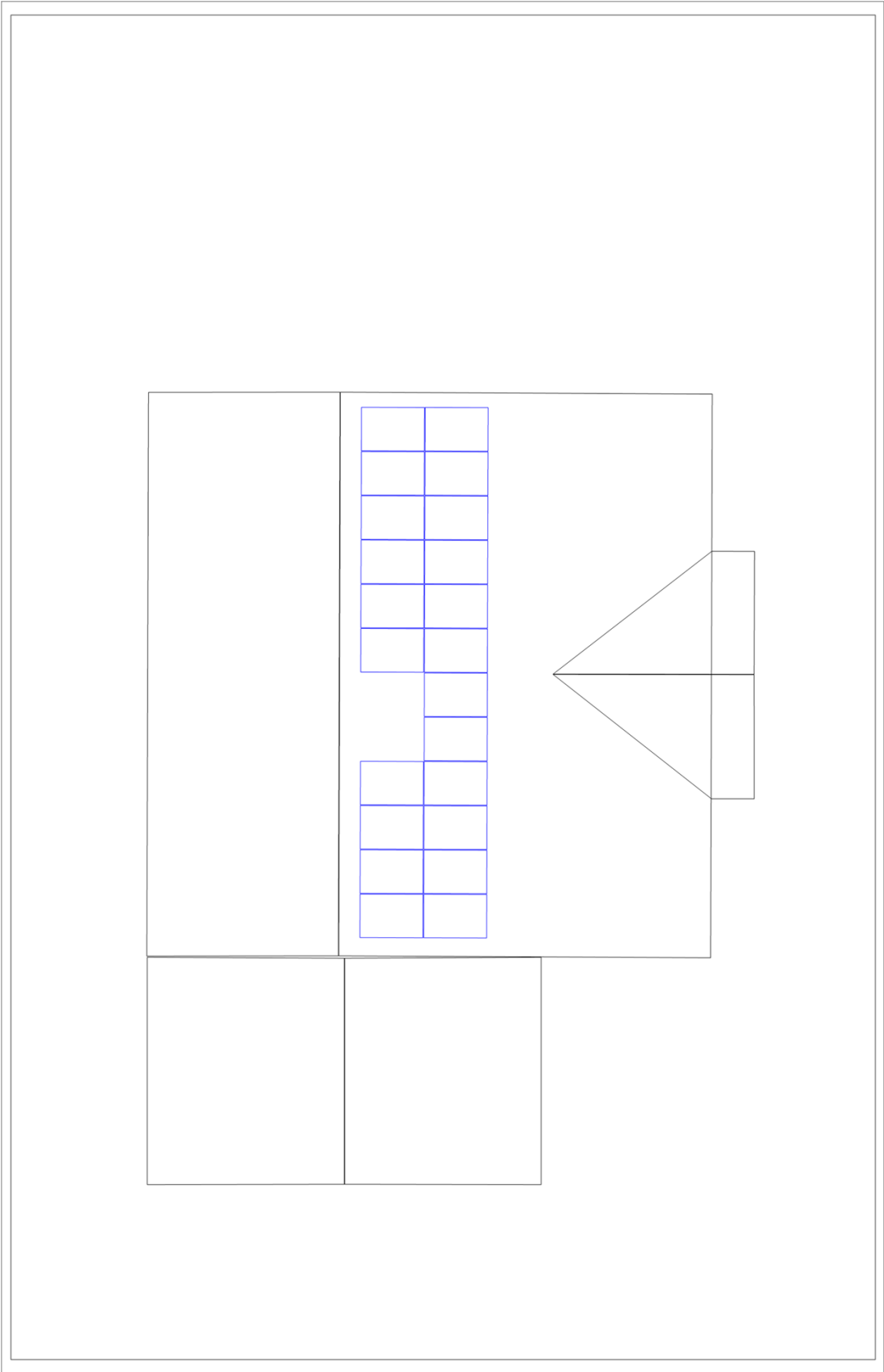


Figure: Overview plan

Dimensioning Plan

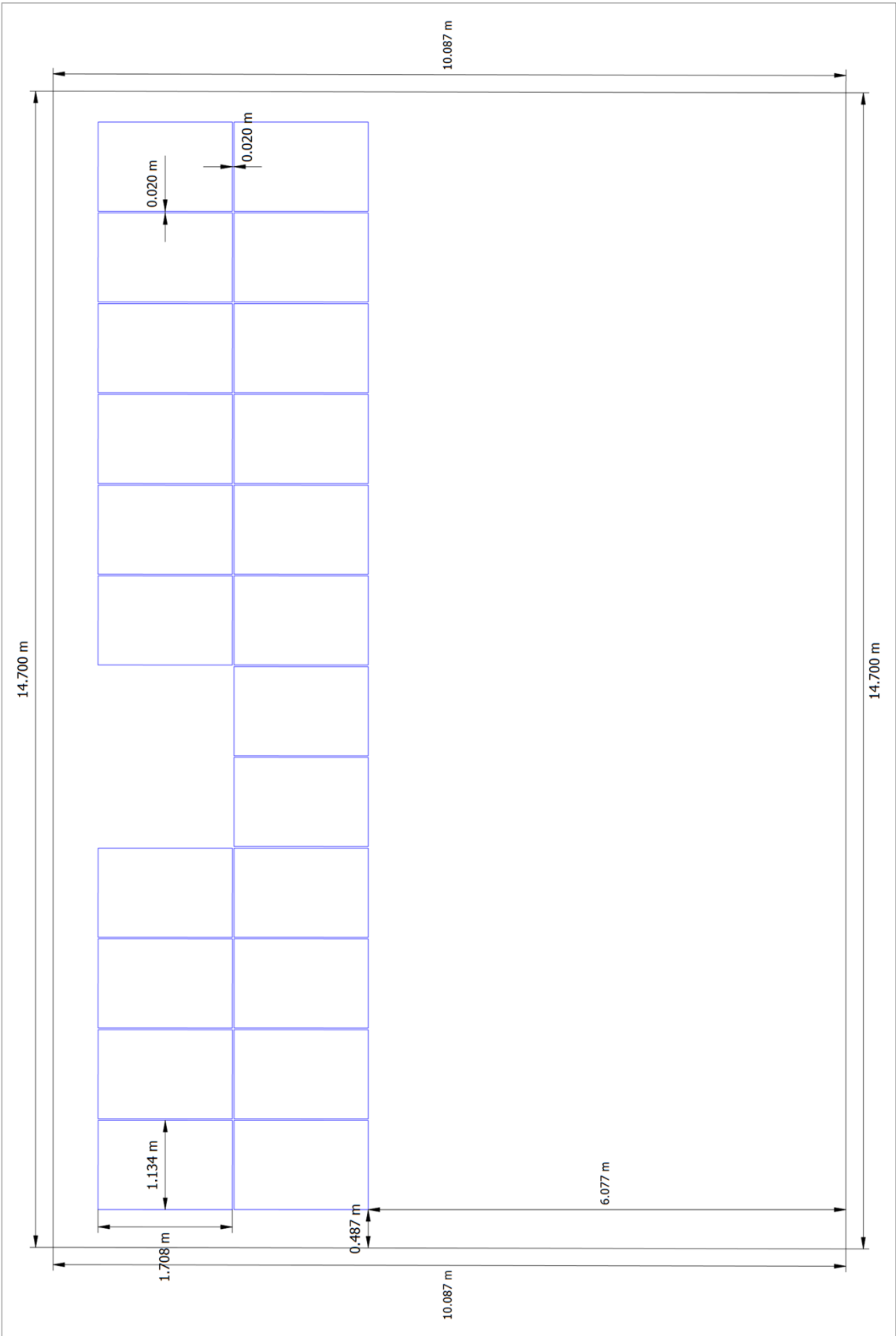


Figure: Building 01 - Roof Area South

String Plan

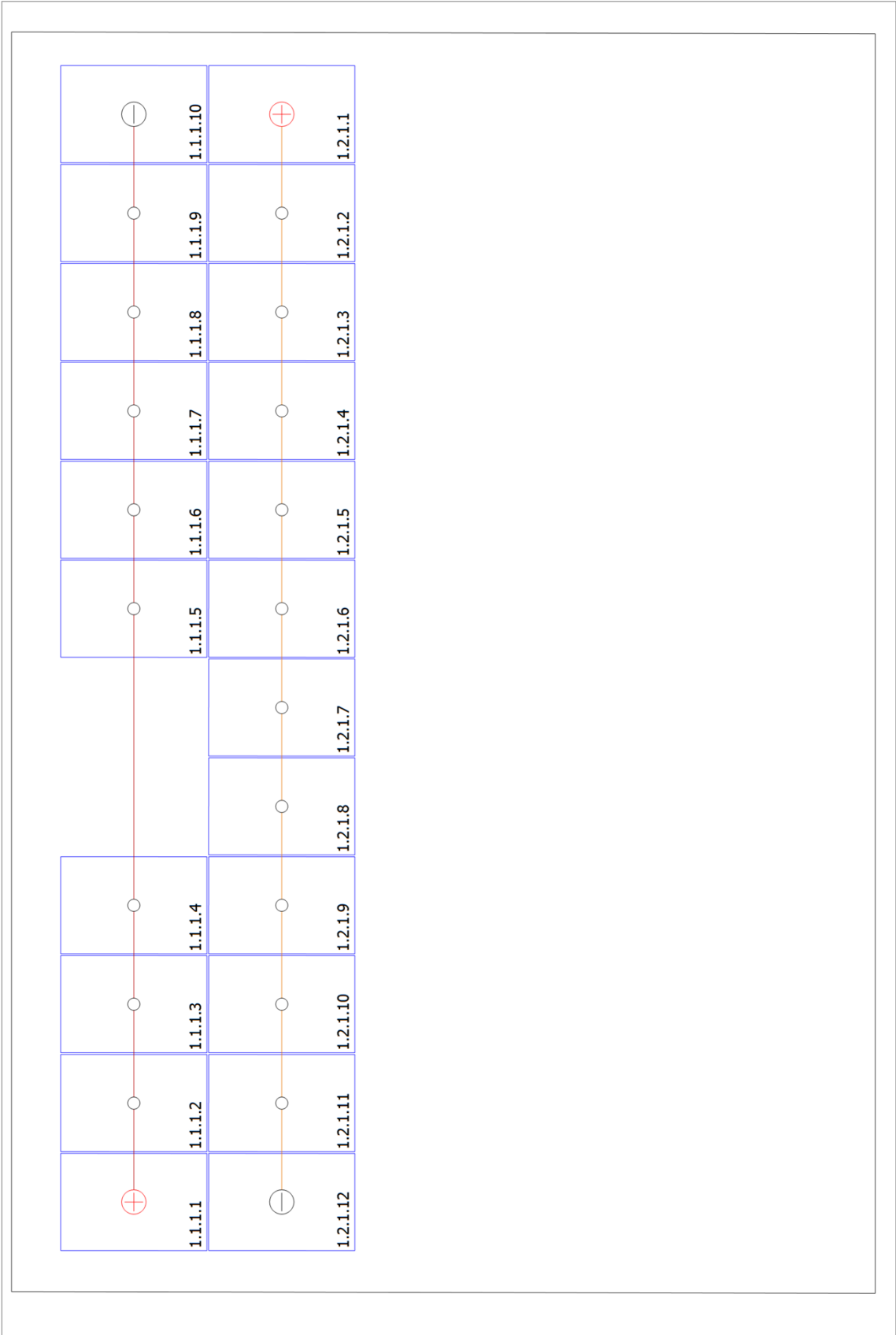


Figure: Building 01 - Roof Area South

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		SOLARWATT	SOLARWATT Panel classic AM 2.0 pure 30, 410Wp	22	Piece
2	Inverter		Deye	SUN-8K-SG01HP3-EU-AM2	1	Piece
3	Battery System		Deye	Deye SUN-8K-SG01HP3-EU-AM2 + Deye BOS-G20 (18.43 kWh)	1	Piece

Screenshots, 3D Design Environment

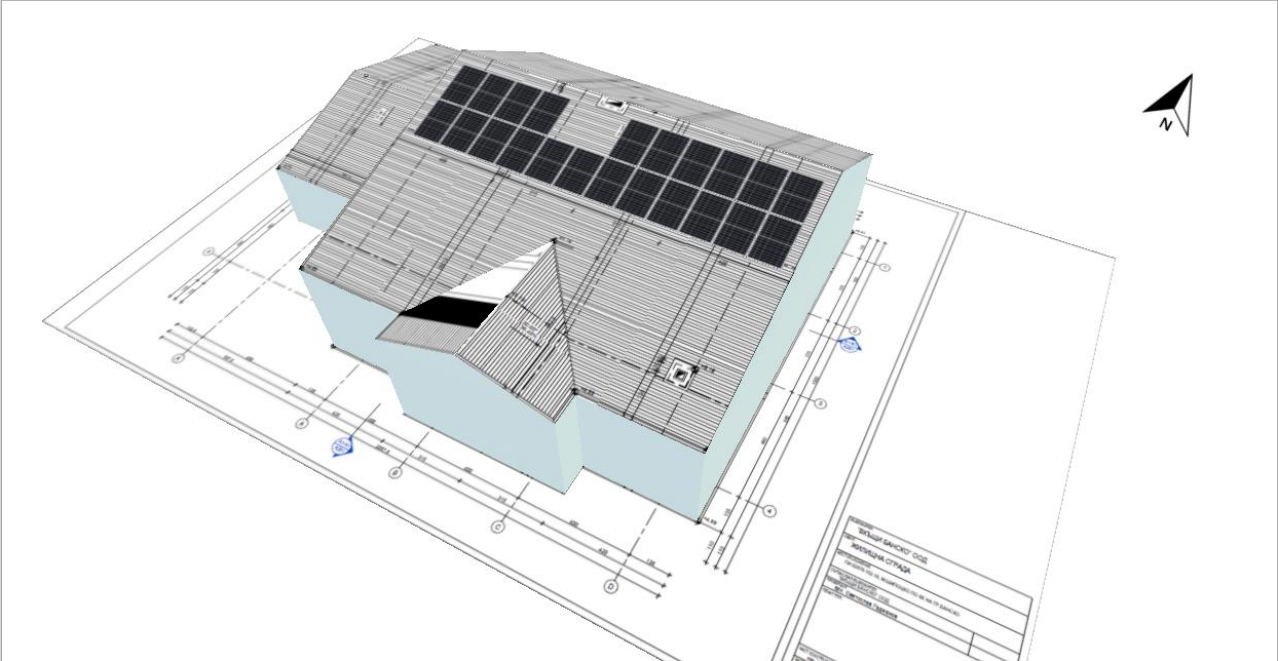


Figure: Screenshot01

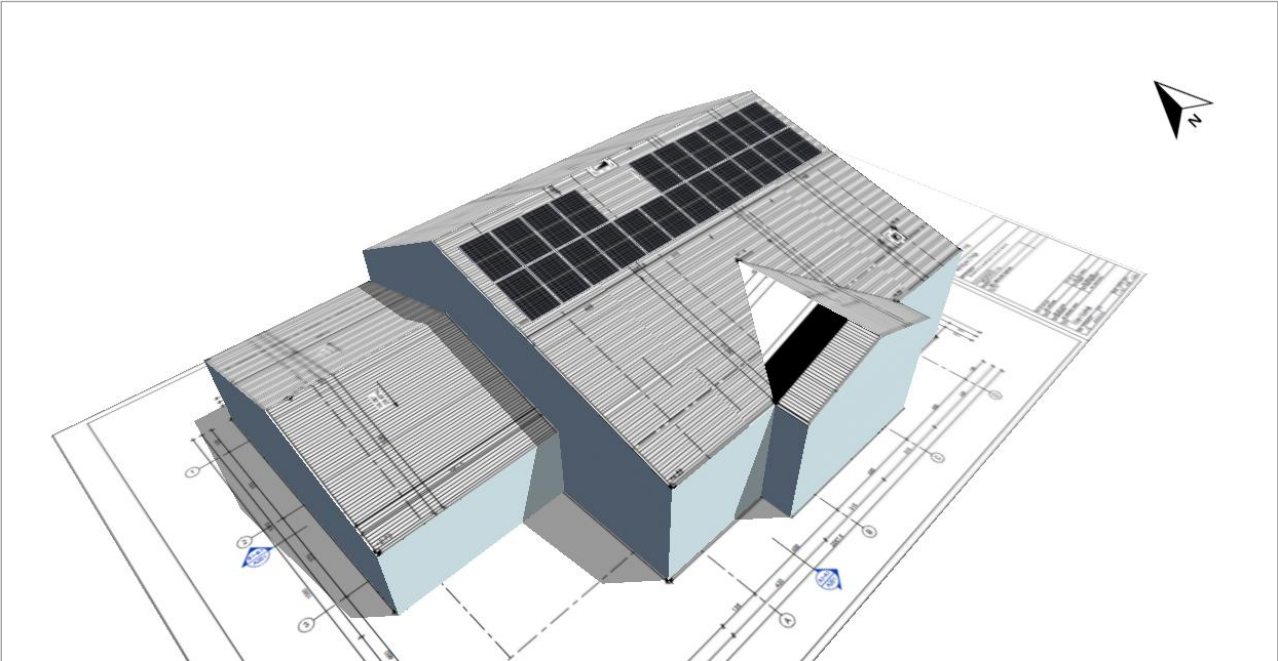


Figure: Screenshot02

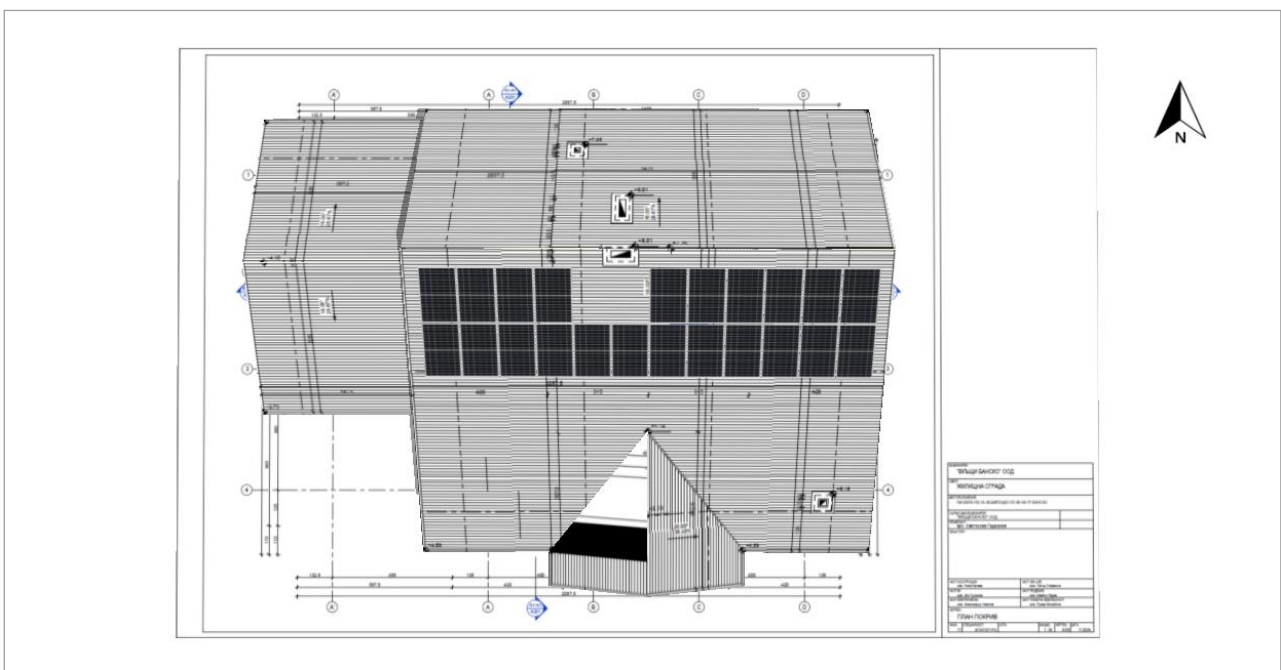


Figure: Screenshot03