



1239 E Arques Ave, Sunnyvale, CA 94085, USA

Project Name: Example Project

21.9.2024 r.

Your PV system

Address of Installation

37.381112, -121.992475



Project Description:

PV-Report

Project Overview

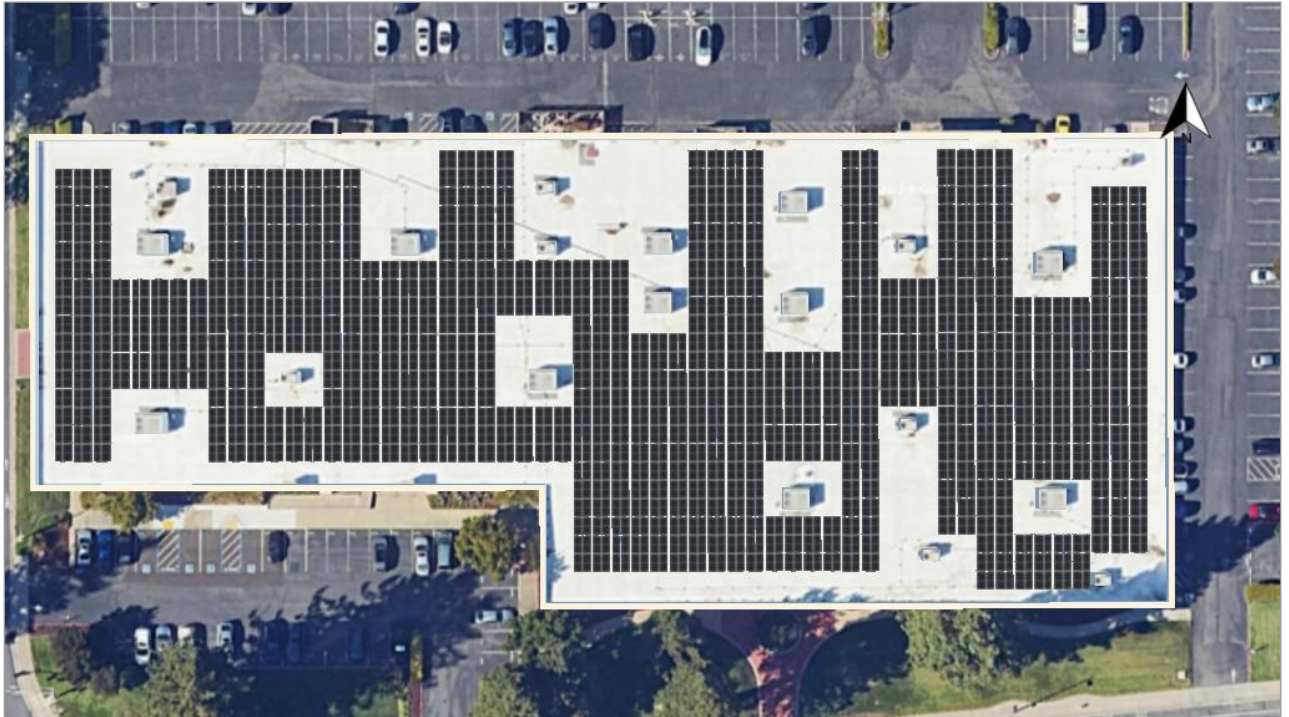


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances

Climate Data	Sunnyvale, USA (2001 - 2020)
Values source	Meteonorm 8.2(i)
PV Generator Output	703.83 kWp
PV Generator Surface	3 516.8 m ²
Number of PV Modules	1618
Number of Inverters	6

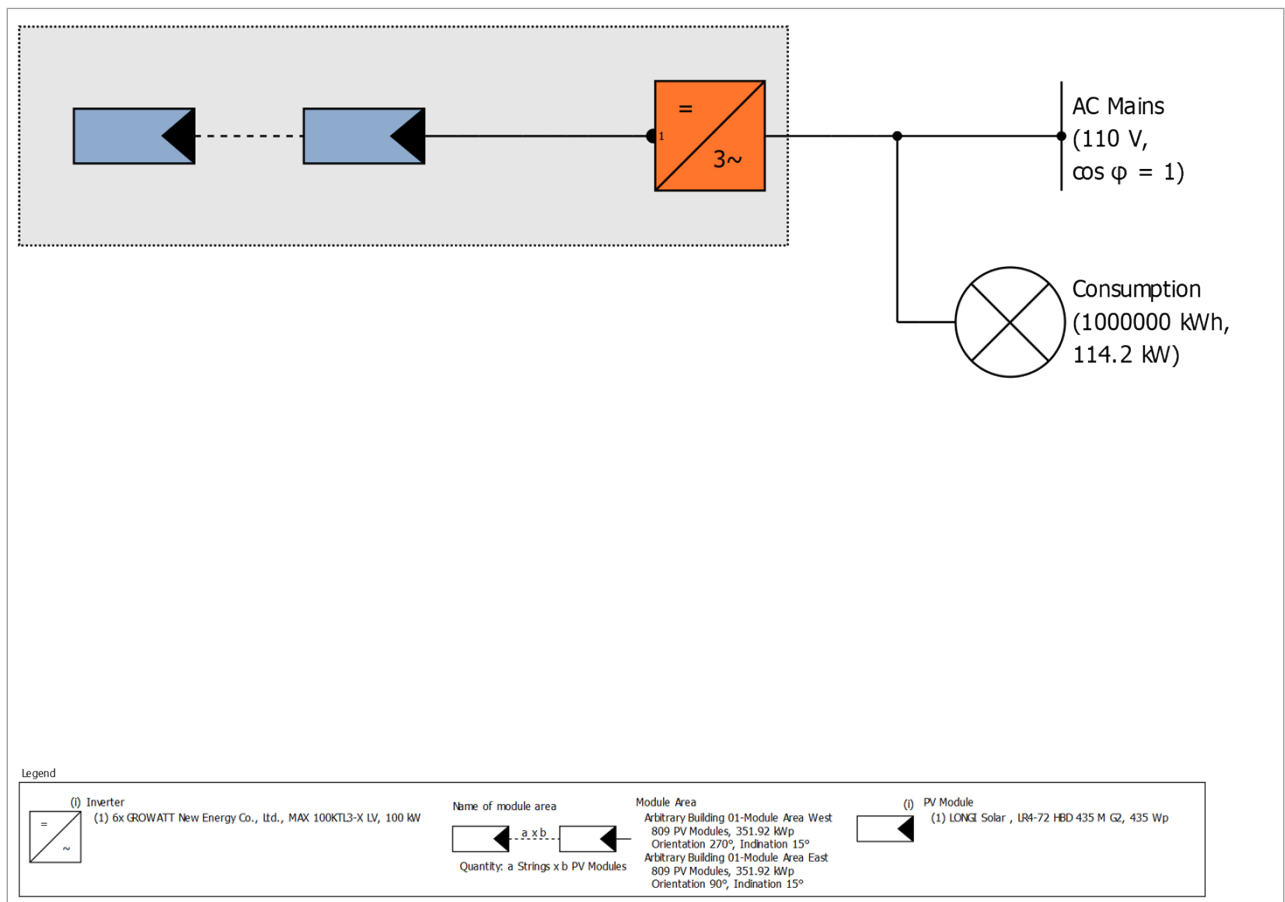


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	703.83 kWp
Spec. Annual Yield	1 461.45 kWh/kWp
Performance Ratio (PR)	87.67 %
Yield Reduction due to Shading	2.1 %
PV Generator Energy (AC grid)	1 028 735 kWh/Year
Own Consumption	405 658 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	623 077 kWh/Year
Own Power Consumption	39.4 %
CO ₂ Emissions avoided	483 446 kg / year
Level of Self-sufficiency	40.6 %

Financial Analysis

Your Gain

Total investment costs	774 213.00 \$
Internal Rate of Return (IRR)	11.55 %
Amortization Period	8.8 Years
Electricity Production Costs	0.0342 \$/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

Climate Data

Location Sunnyvale, USA (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 1000000 kWh

New 1000000 kWh

Load Peak 114.2 kW

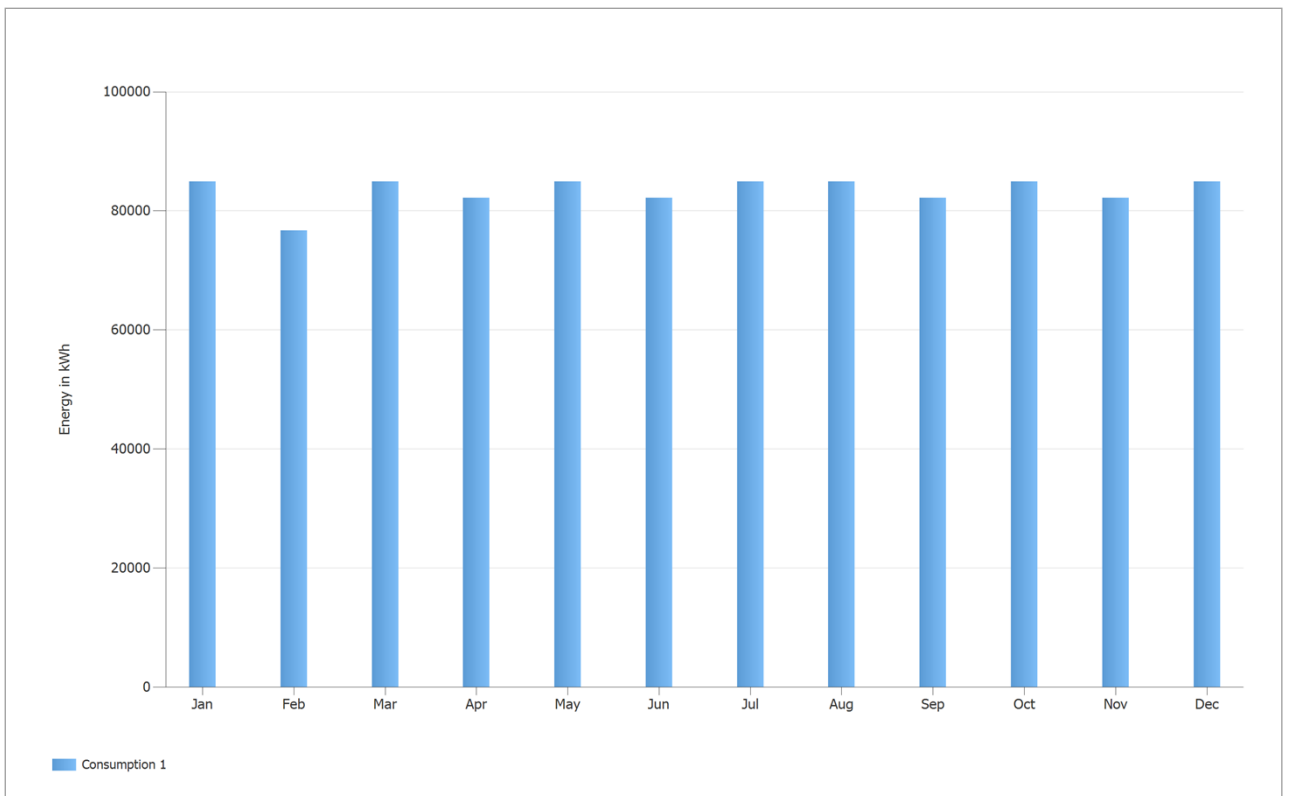


Figure: Consumption

Module Areas

1. Module Area - Arbitrary Building 01-Module Area West

PV Generator, 1. Module Area - Arbitrary Building 01-Module Area West

Name	Arbitrary Building 01-Module Area West
PV Modules	809 x LR4-72 HBD 435 M G2 (v4)
Manufacturer	LONGI Solar
Inclination	15 °
Orientation	West 270 °
Installation Type	Mounted - Roof
PV Generator Surface	1 758.4 m ²



Figure: 1. Module Area - Arbitrary Building 01-Module Area West

2. Module Area - Arbitrary Building 01-Module Area East

PV Generator, 2. Module Area - Arbitrary Building 01-Module Area East

Name	Arbitrary Building 01-Module Area East
PV Modules	809 x LR4-72 HBD 435 M G2 (v4)
Manufacturer	LONGI Solar
Inclination	15 °
Orientation	East 90 °
Installation Type	Mounted - Roof
PV Generator Surface	1 758.4 m ²



Figure: 2. Module Area - Arbitrary Building 01-Module Area East

Horizon Line, 3D Design

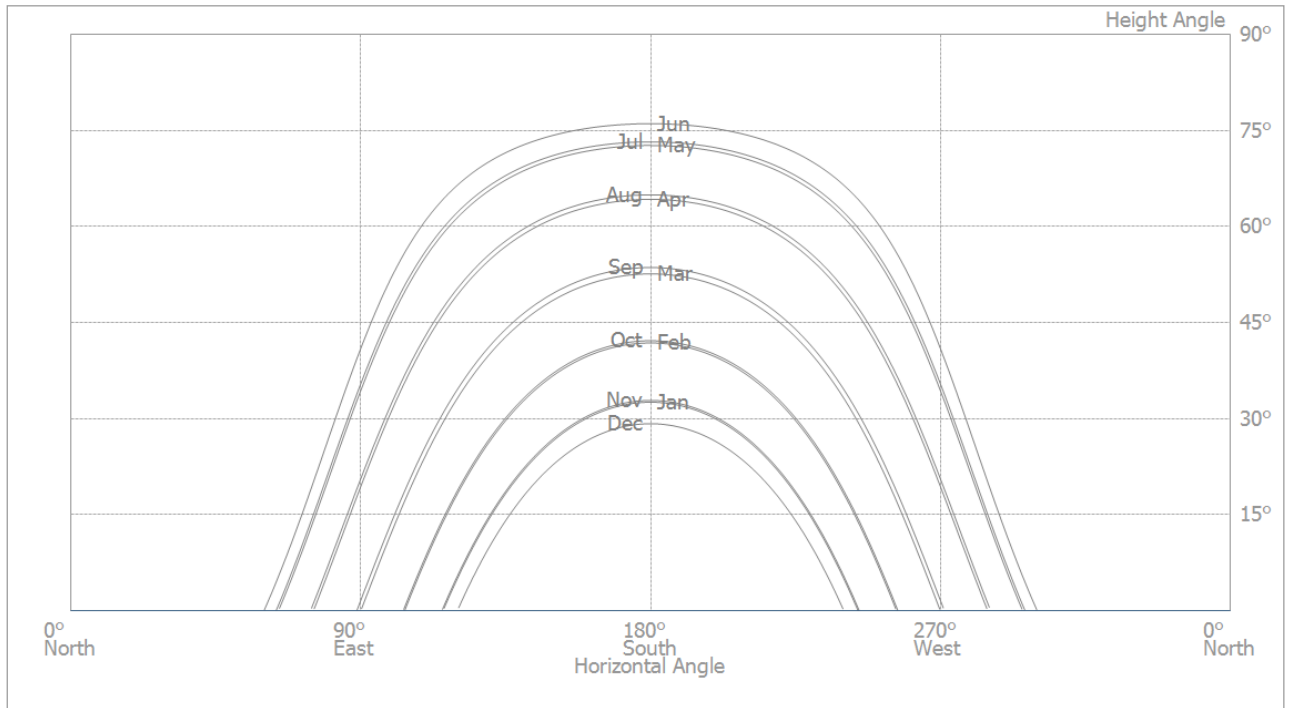


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Areas	Arbitrary Building 01-Module Area West + Arbitrary Building 01-Module Area East
Inverter 1	
Model	MAX 100KTL3-X LV (v2)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	117 %
Configuration	MPP 1: 3 x 11
	MPP 2: 3 x 11
	MPP 3: 3 x 11
	MPP 4: 3 x 11
	MPP 5: 3 x 11
	MPP 6: 3 x 11
	MPP 7: 3 x 11
	MPP 8: 2 x 11
	MPP 9: 1 x 8
	MPP 10: 1 x 8
Inverter 2	
Model	MAX 100KTL3-X LV (v2)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	117 %
Configuration	MPP 1: 3 x 11
	MPP 2: 3 x 11
	MPP 3: 3 x 11
	MPP 4: 3 x 11
	MPP 5: 3 x 11
	MPP 6: 3 x 11
	MPP 7: 3 x 11
	MPP 8: 2 x 11
	MPP 9: 1 x 8
	MPP 10: 1 x 8
Inverter 3	
Model	MAX 100KTL3-X LV (v2)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	117.9 %
Configuration	MPP 1: 3 x 11
	MPP 2: 3 x 11
	MPP 3: 3 x 11
	MPP 4: 3 x 11
	MPP 5: 3 x 11
	MPP 6: 3 x 11
	MPP 7: 3 x 11
	MPP 8: 2 x 11
	MPP 9: 1 x 9
	MPP 10: 1 x 9
Inverter 4	
Model	MAX 100KTL3-X LV (v2)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	117 %
Configuration	MPP 1: 3 x 11

	MPP 2: 3 x 11
	MPP 3: 3 x 11
	MPP 4: 3 x 11
	MPP 5: 3 x 11
	MPP 6: 3 x 11
	MPP 7: 3 x 11
	MPP 8: 2 x 11
	MPP 9: 1 x 8
	MPP 10: 1 x 8

Inverter 5

Model	MAX 100KTL3-X LV (v2)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	117 %
Configuration	MPP 1: 3 x 11
	MPP 2: 3 x 11
	MPP 3: 3 x 11
	MPP 4: 3 x 11
	MPP 5: 3 x 11
	MPP 6: 3 x 11
	MPP 7: 3 x 11
	MPP 8: 2 x 11
	MPP 9: 1 x 8
	MPP 10: 1 x 8

Inverter 6

Model	MAX 100KTL3-X LV (v2)
Manufacturer	GROWATT New Energy Co., Ltd.
Quantity	1
Sizing Factor	117.9 %
Configuration	MPP 1: 3 x 11
	MPP 2: 3 x 11
	MPP 3: 3 x 11
	MPP 4: 3 x 11
	MPP 5: 3 x 11
	MPP 6: 3 x 11
	MPP 7: 3 x 11
	MPP 8: 2 x 11
	MPP 9: 1 x 9
	MPP 10: 1 x 9

AC Mains

AC Mains

Number of Phases	3
Mains voltage between phase and neutral	110 V
Displacement Power Factor (cos phi)	+/- 1

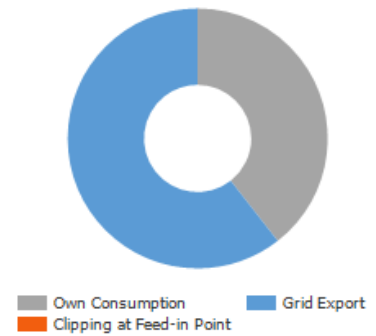
Simulation Results

Results Total System

PV System

PV Generator Output	703.83 kWp
Spec. Annual Yield	1 461.45 kWh/kWp
Performance Ratio (PR)	87.67 %
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PV Generator Energy (AC grid)	1 028 735 kWh/Year
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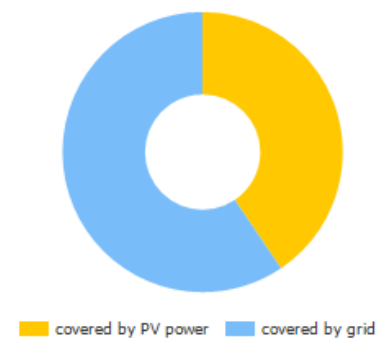
PV Generator Energy (AC grid)



Appliances

Appliances	1 000 000 kWh/Year
Standby Consumption (Inverter)	125 kWh/Year
Total Consumption	1 000 125 kWh/Year
covered by PV power	405 658 kWh/Year
covered by grid	594 468 kWh/Year
Solar Fraction	40.6 %

Total Consumption

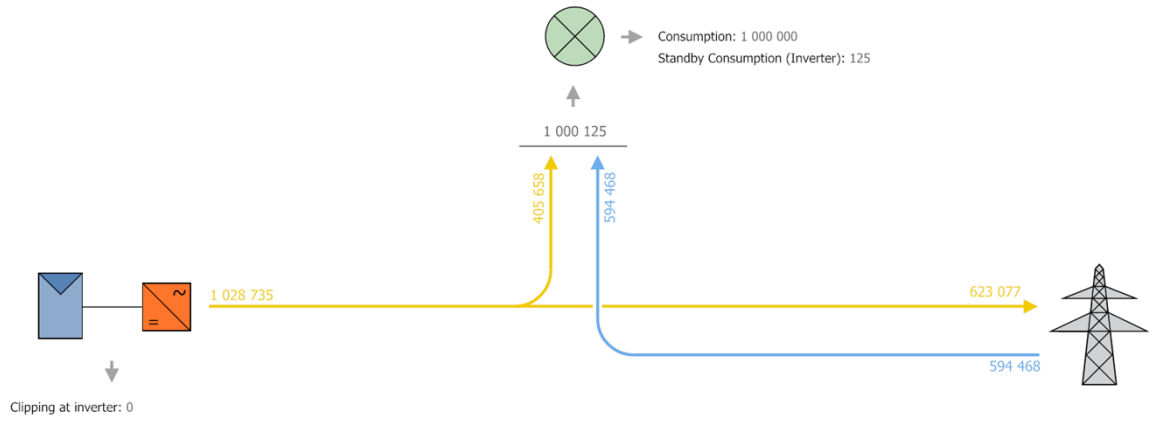


Level of Self-sufficiency

Total Consumption	1 000 125 kWh/Year
covered by grid	594 468 kWh/Year
Level of Self-sufficiency	40.6 %

Energy Flow Graph

Project: Example Project



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

Figure: Energy flow

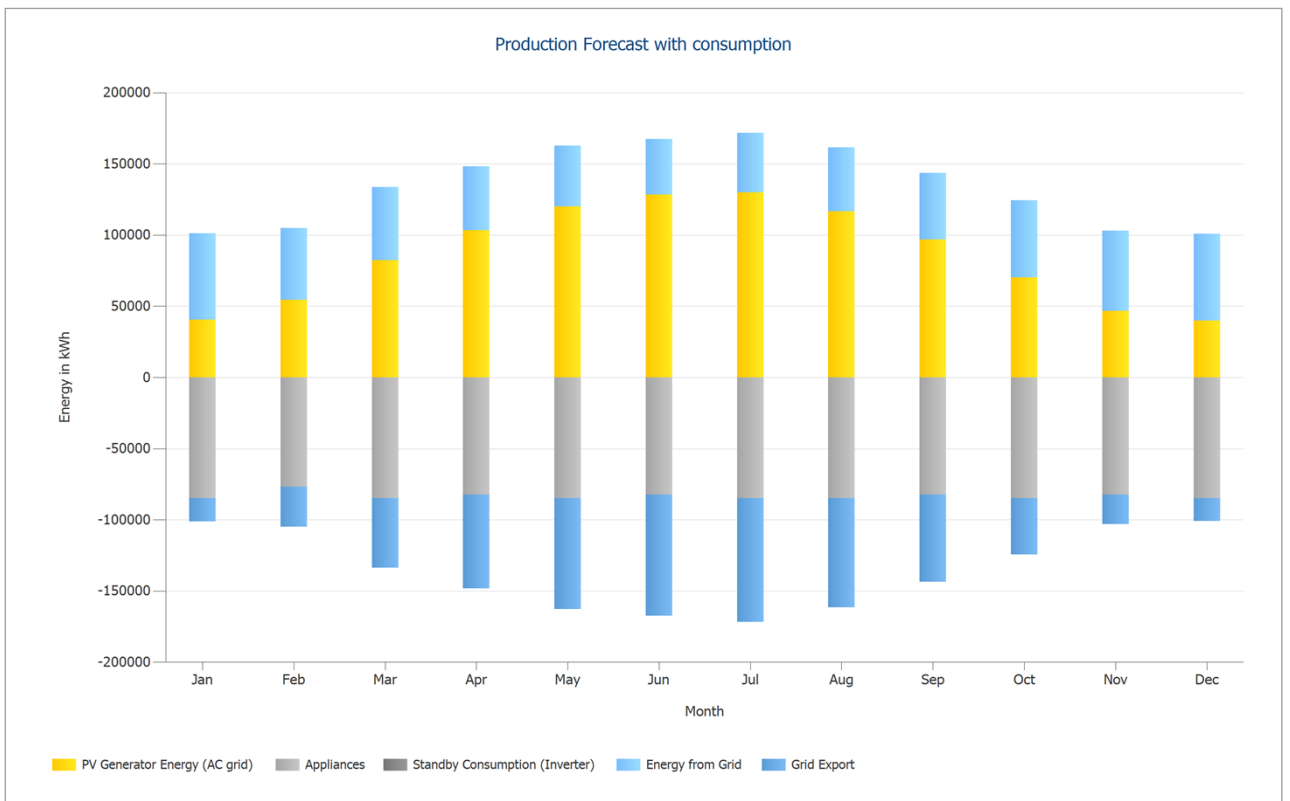


Figure: Production Forecast with consumption

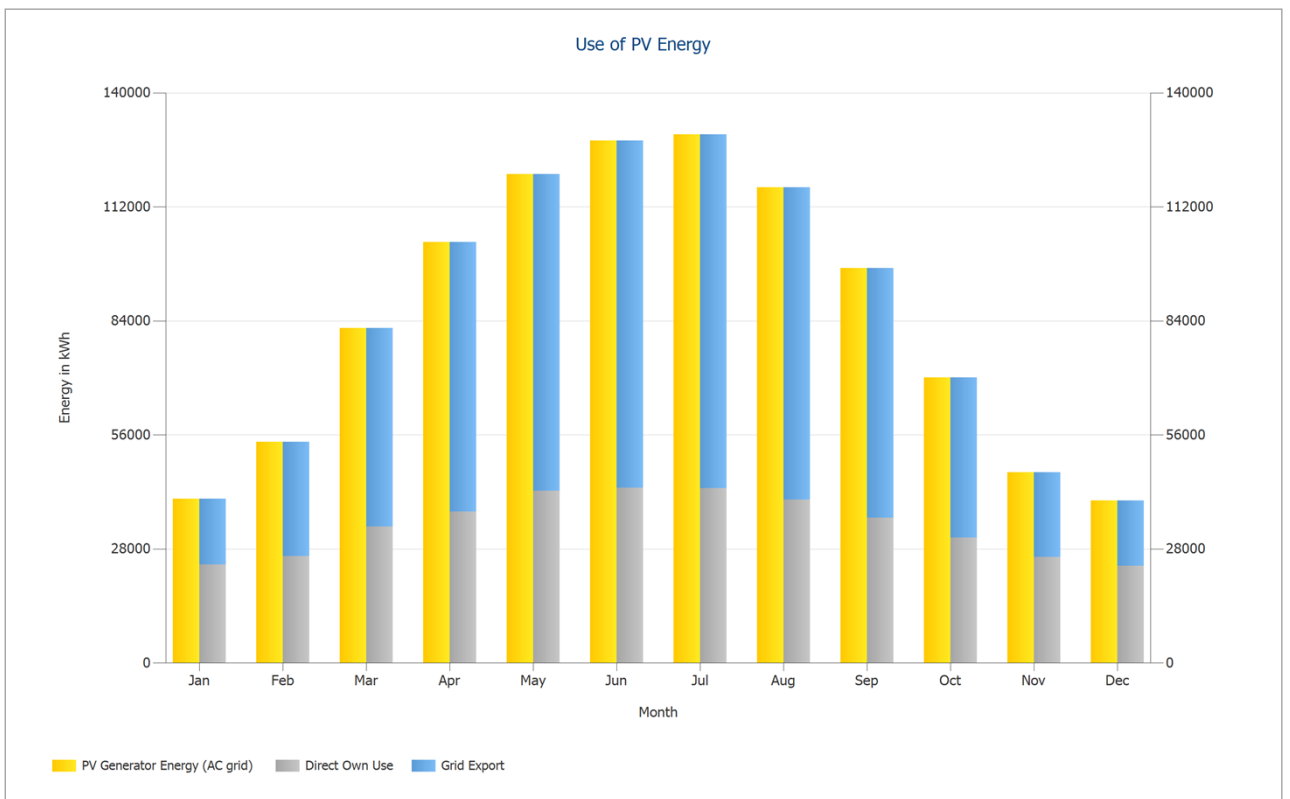


Figure: Use of PV Energy

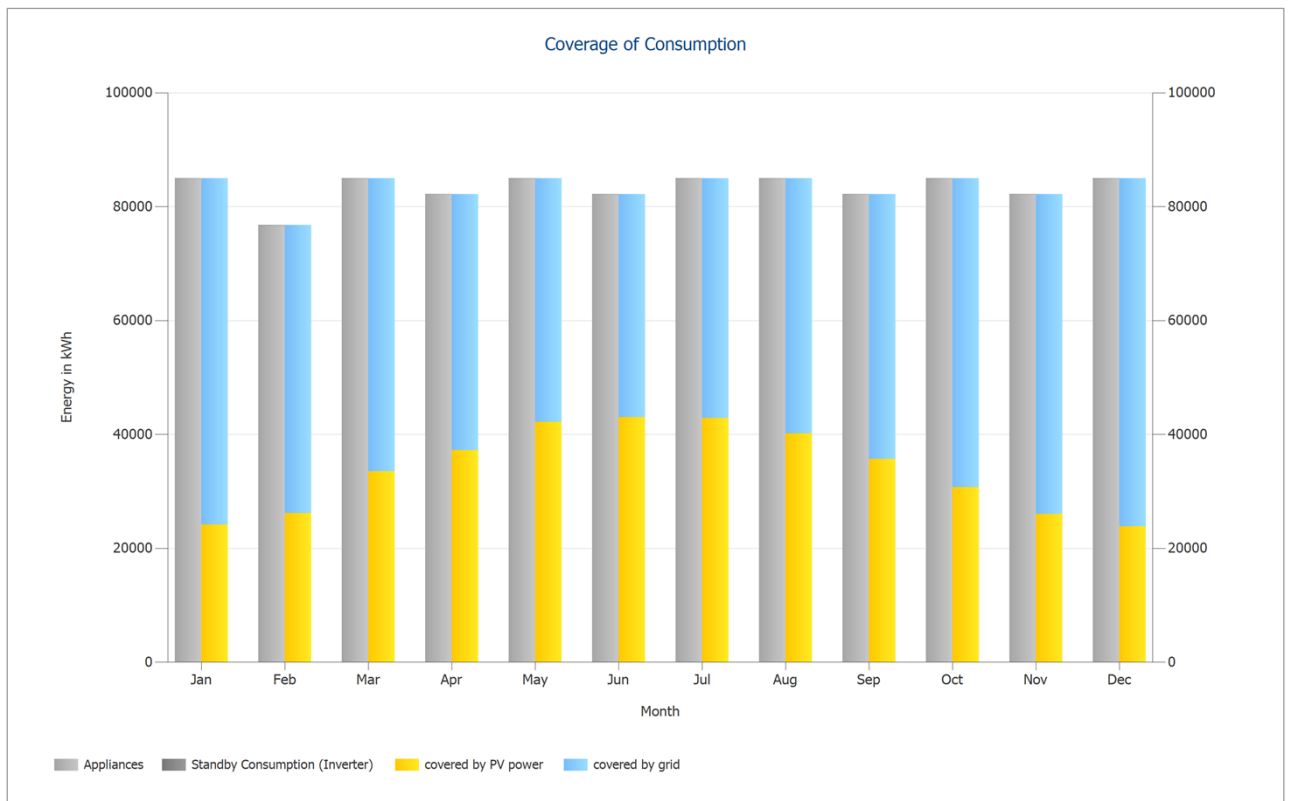


Figure: Coverage of Consumption

Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	616 882 kWh/Year
PV Generator Output	703.8 kWp
Start of Operation of the System	21.9.2024 r.
Assessment Period	25 Years
Interest on Capital	1 %

Economic Parameters

Internal Rate of Return (IRR)	11.55 %
Accrued Cash Flow (Cash Balance)	1 492 813.45 \$
Amortization Period	8.8 Years
Electricity Production Costs	0.0342 \$/kWh

Payment Overview

Specific Investment Costs	1 100.00 \$/kWp
Investment Costs	774 213.00 \$
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	57 853.47 \$/Year
First year savings	32 171.67 \$/Year

California feed-in tariff program - 25 year term - All

Validity	21.9.2024 r. - 20.9.2049 r.
Specific feed-in / export Remuneration	0.0927 \$/kWh
Feed-in / Export Tariff	57853.4658 \$/Year
Inflation Rate for Feed-in / Export Tariff	2.00 %/Year

Average electricity cost (Example)

Energy Price	0.08 \$/kWh
Inflation Rate for Energy Price	2 %/Year

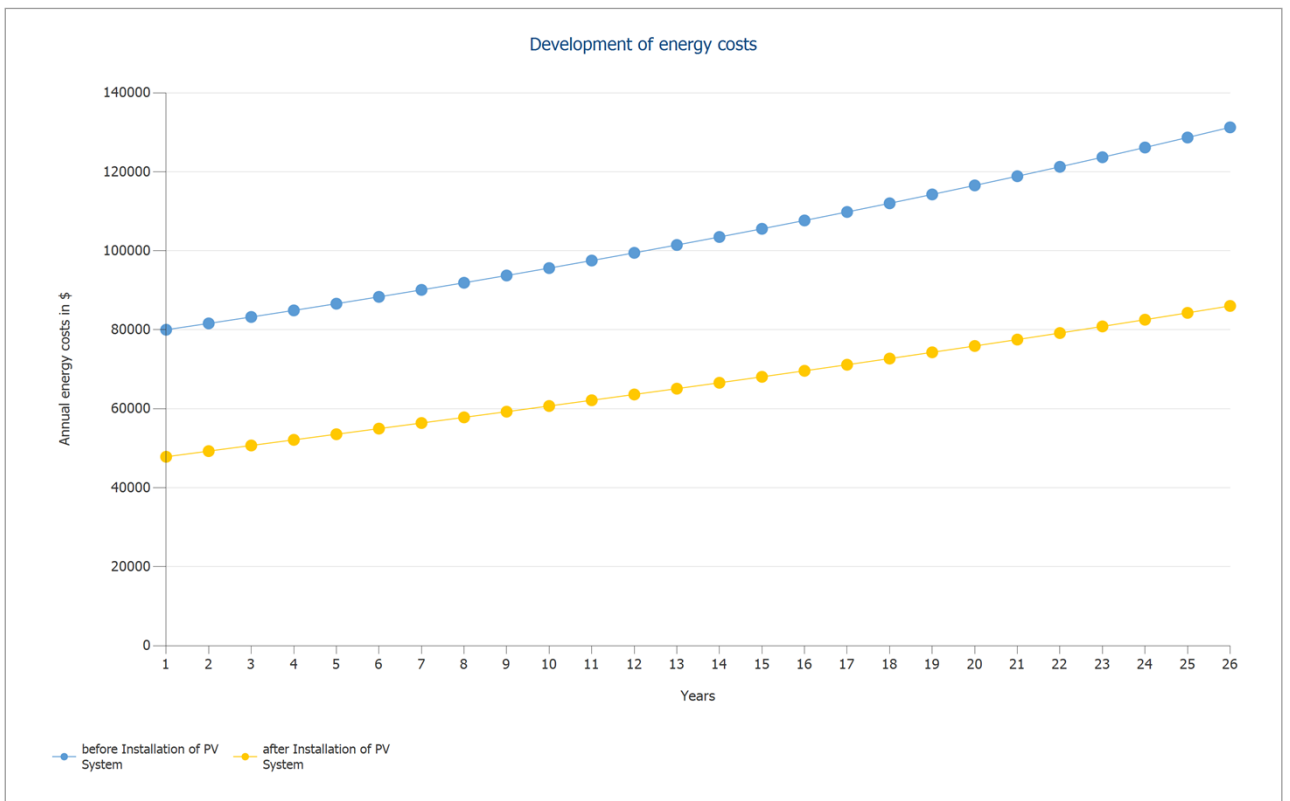


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
Investments	-774 213.00 \$	0.00 \$	0.00 \$	0.00 \$	0.00 \$
Feed-in / Export Tariff	53 536.53 \$	57 019.58 \$	56 826.34 \$	56 695.70 \$	56 622.87 \$
Electricity Savings	30 581.11 \$	31 698.10 \$	31 581.13 \$	31 499.27 \$	31 449.81 \$
Annual Cash Flow	-690 095.37 \$	88 717.68 \$	88 407.47 \$	88 194.97 \$	88 072.67 \$
Accrued Cash Flow (Cash Balance)	-690 095.37 \$	-601 377.68 \$	-512 970.21 \$	-424 775.24 \$	-336 702.57 \$

Cash flow

	Year 6	Year 7	Year 8	Year 9	Year 10
Investments	0.00 \$	0.00 \$	0.00 \$	0.00 \$	0.00 \$
Feed-in / Export Tariff	56 603.45 \$	56 633.45 \$	56 709.18 \$	56 827.30 \$	56 984.73 \$
Electricity Savings	31 430.29 \$	31 438.42 \$	31 472.17 \$	31 529.59 \$	31 609.01 \$
Annual Cash Flow	88 033.75 \$	88 071.86 \$	88 181.36 \$	88 356.89 \$	88 593.74 \$
Accrued Cash Flow (Cash Balance)	-248 668.82 \$	-160 596.96 \$	-72 415.60 \$	15 941.29 \$	104 535.03 \$

Cash flow

	Year 11	Year 12	Year 13	Year 14	Year 15
Investments	0.00 \$	0.00 \$	0.00 \$	0.00 \$	0.00 \$
Feed-in / Export Tariff	57 178.67 \$	57 406.55 \$	57 666.02 \$	57 954.95 \$	58 271.37 \$
Electricity Savings	31 708.78 \$	31 827.50 \$	31 963.84 \$	32 116.58 \$	32 284.61 \$
Annual Cash Flow	88 887.44 \$	89 234.05 \$	89 629.86 \$	90 071.53 \$	90 555.98 \$
Accrued Cash Flow (Cash Balance)	193 422.48 \$	282 656.52 \$	372 286.39 \$	462 357.92 \$	552 913.89 \$

Cash flow

	Year 16	Year 17	Year 18	Year 19	Year 20
Investments	0.00 \$	0.00 \$	0.00 \$	0.00 \$	0.00 \$
Feed-in / Export Tariff	58 613.50 \$	58 979.70 \$	59 368.48 \$	59 778.49 \$	60 208.48 \$
Electricity Savings	32 466.91 \$	32 662.62 \$	32 870.81 \$	33 090.79 \$	33 321.82 \$
Annual Cash Flow	91 080.41 \$	91 642.31 \$	92 239.29 \$	92 869.28 \$	93 530.30 \$
Accrued Cash Flow (Cash Balance)	643 994.30 \$	735 636.62 \$	827 875.91 \$	920 745.19 \$	1 014 275.49 \$

Cash flow

	Year 21	Year 22	Year 23	Year 24	Year 25
Investments	0.00 \$	0.00 \$	0.00 \$	0.00 \$	0.00 \$
Feed-in / Export Tariff	60 657.33 \$	61 124.00 \$	61 607.56 \$	62 107.15 \$	62 622.00 \$
Electricity Savings	33 563.26 \$	33 814.55 \$	34 075.16 \$	34 344.57 \$	34 622.39 \$
Annual Cash Flow	94 220.59 \$	94 938.55 \$	95 682.72 \$	96 451.72 \$	97 244.38 \$
Accrued Cash Flow (Cash Balance)	1 108 496.08 \$	1 203 434.63 \$	1 299 117.35 \$	1 395 569.07 \$	1 492 813.45 \$

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

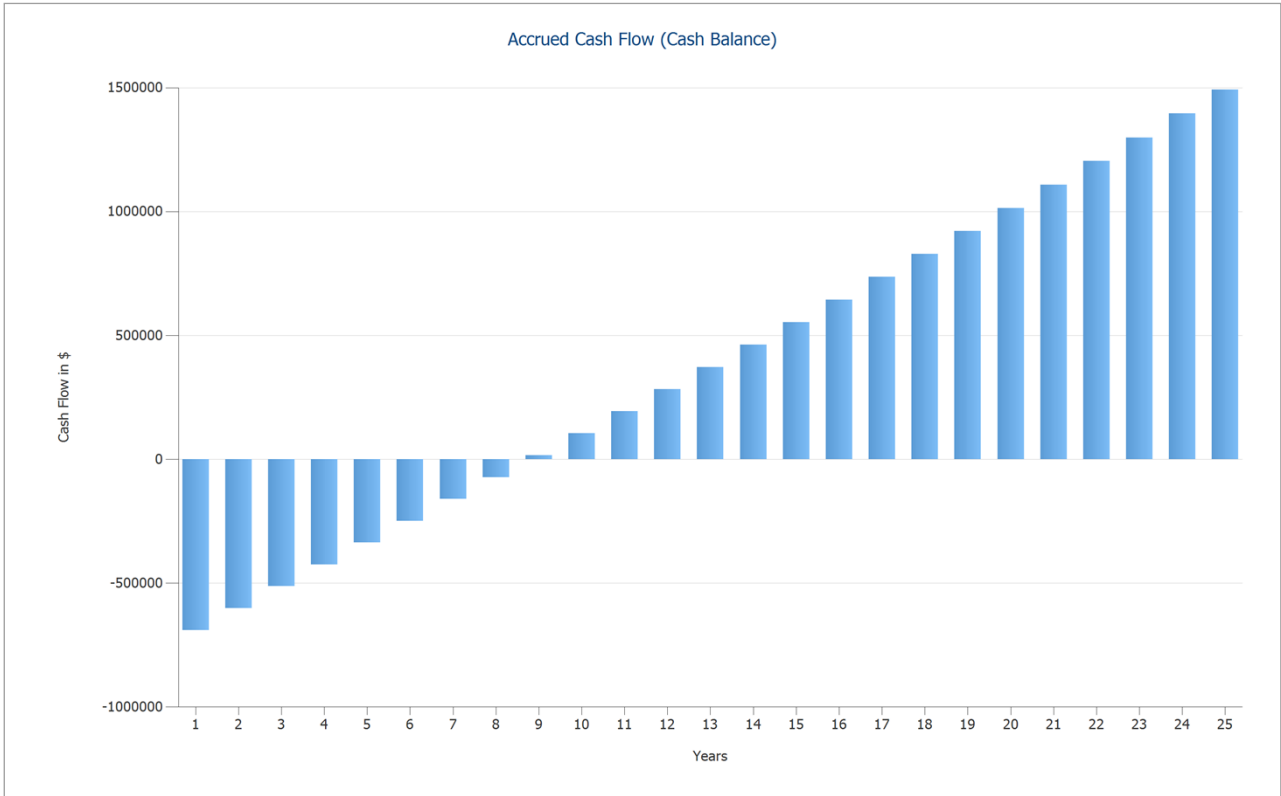


Figure: Accrued Cash Flow (Cash Balance)

Data Sheets

PV Module Data Sheet

PV Module: LR4-72 HBD 435 M G2 (v4)

Manufacturer	LONGI Solar
Available	Yes

Electrical Data

Cell Type	Si monocrystalline
Half-cell module	Yes
Cell Count	144
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	40.8 V
MPP Current	10.66 A
Open Circuit Voltage	49.1 V
Short-Circuit Current	11.36 A
Increase open circuit voltage before stabilisation	0 %
Nominal output	435 W
Fill Factor	77.98 %
Efficiency	20.01 %

I/V Part Load Characteristics

Values source	Manufacturer/user-created
Irradiance	200 W/m ²
Voltage in MPP at Part Load	39.17 V
Current in MPP at Part Load	2.17 A
Open Circuit Voltage (Part Load)	46.016 V
Short Circuit Current at Part Load	2.31 A

Additional Parameters

Temperature Coefficient of Voc	-139.4 mV/K
Temperature Coefficient of Isc	5.7 mA/K
Temperature Coefficient of Pmpp	-0.35 %/K
Incident Angle Modifier (IAM)	100 %
Bifacial factor	70 %
Maximum System Voltage	1500 V

Mechanical Data

Width	1038 mm
Height	2094 mm
Depth	30 mm
Frame Width	30 mm
Weight	27.5 kg

Inverter Data Sheet

Inverter: MAX 100KTL3-X LV (v2)

Manufacturer	GROWATT New Energy Co., Ltd.
Available	Yes

Electrical data - DC

DC nominal output	150 kW
Max. DC Power	150 kW
Nom. DC Voltage	600 V
Max. Input Voltage	1100 V
Max. Input Current	320 A
Max. short circuit current	320 A
Number of DC Inlets	20

Electrical data - AC

AC Power Rating	100 kW
Max. AC Power	110 kVA
Nom. AC Voltage	230 V
Number of Phases	3
With Transformer	No

Electrical data - other

Change in Efficiency when Input Voltage deviates from Rated Voltage	0.2 %/100V
Min. Feed-in Power	195 W
Standby Consumption	25 W
Night Consumption	1 W

MPP Tracker

Output Range < 20% of Power Rating	99.5 %
Output Range > 20% of Power Rating	99.9 %
Count of MPP Trackers	10

MPP Tracker 1-10

Max. Input Current	32 A
Max. short circuit current	32 A
Max. Input Power	18.75 kW
Min. MPP Voltage	180 V
Max. MPP Voltage	1000 V

Plans and parts list

Circuit Diagram

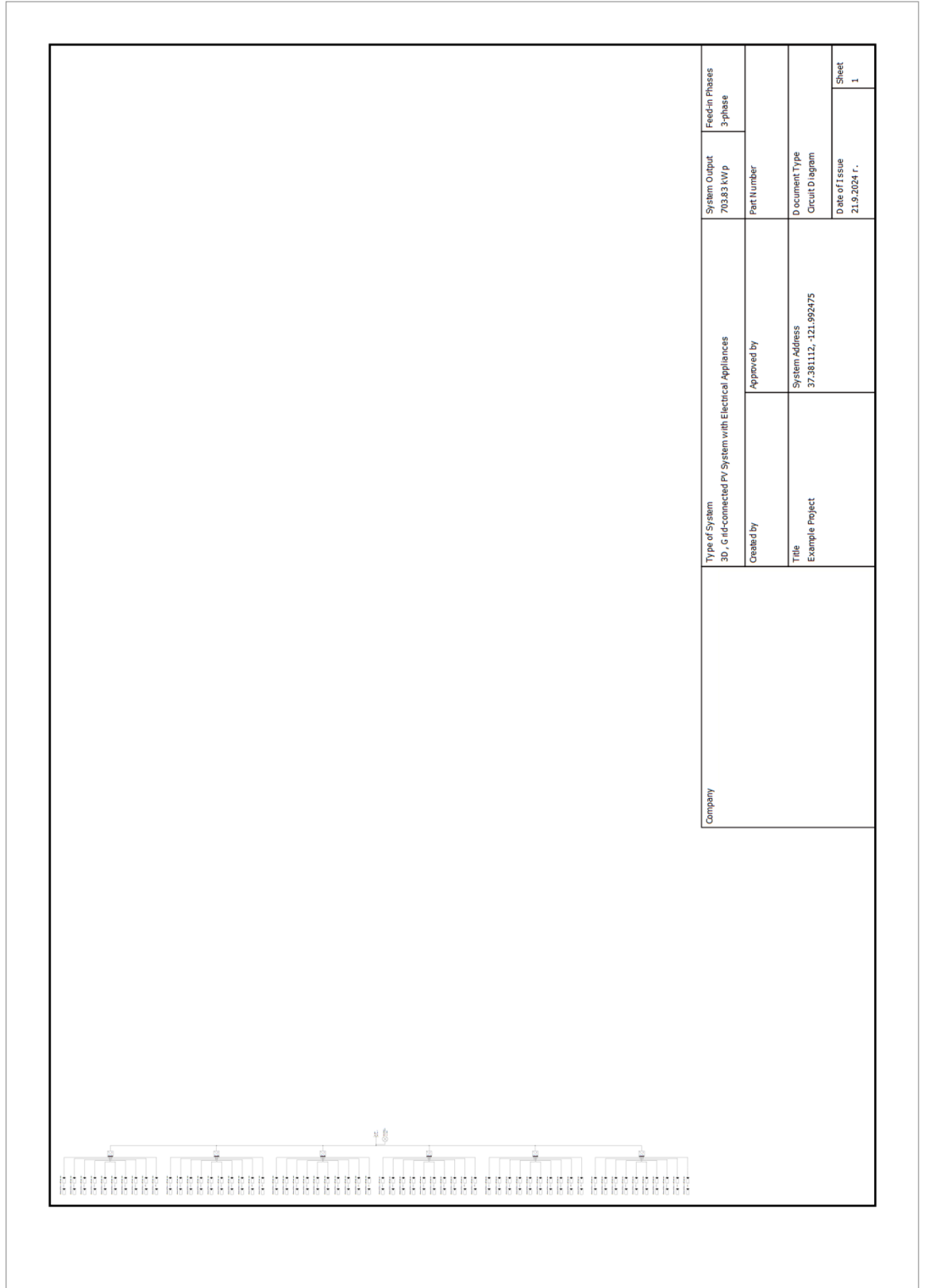


Figure: Circuit Diagram

Overview plan

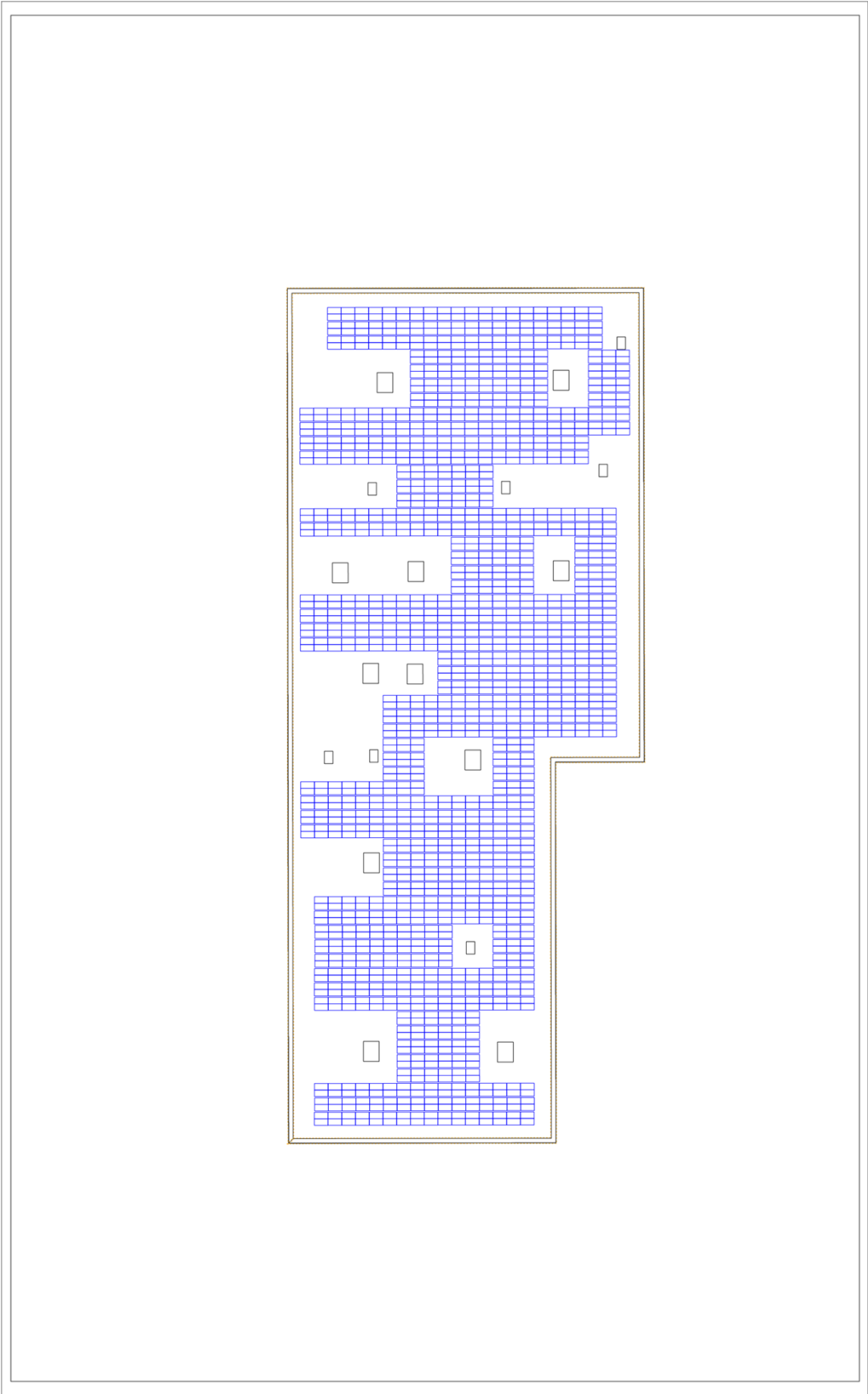


Figure: Overview plan

Dimensioning Plan

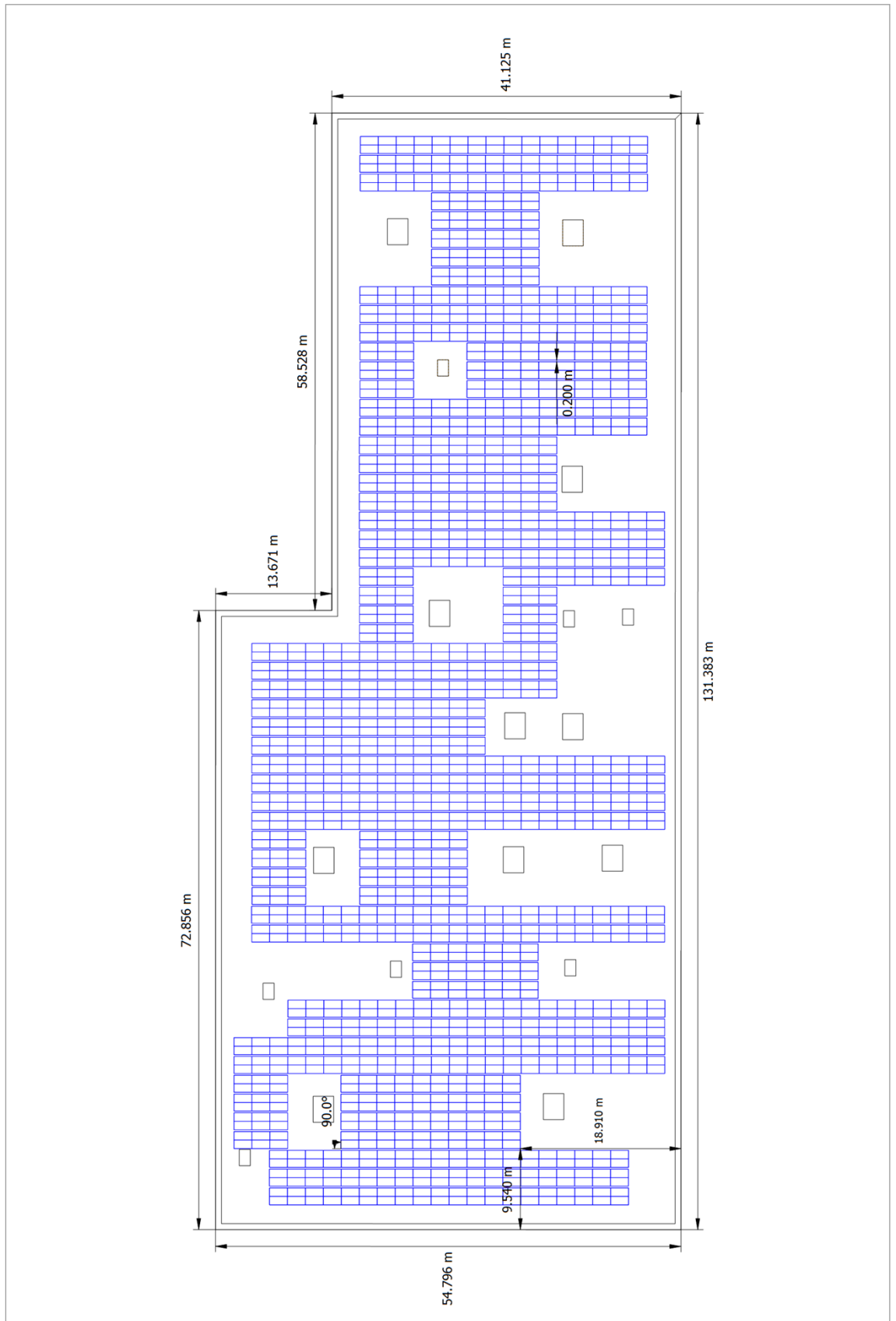


Figure: Arbitrary Building 01 - Mounting Surface North

String Plan

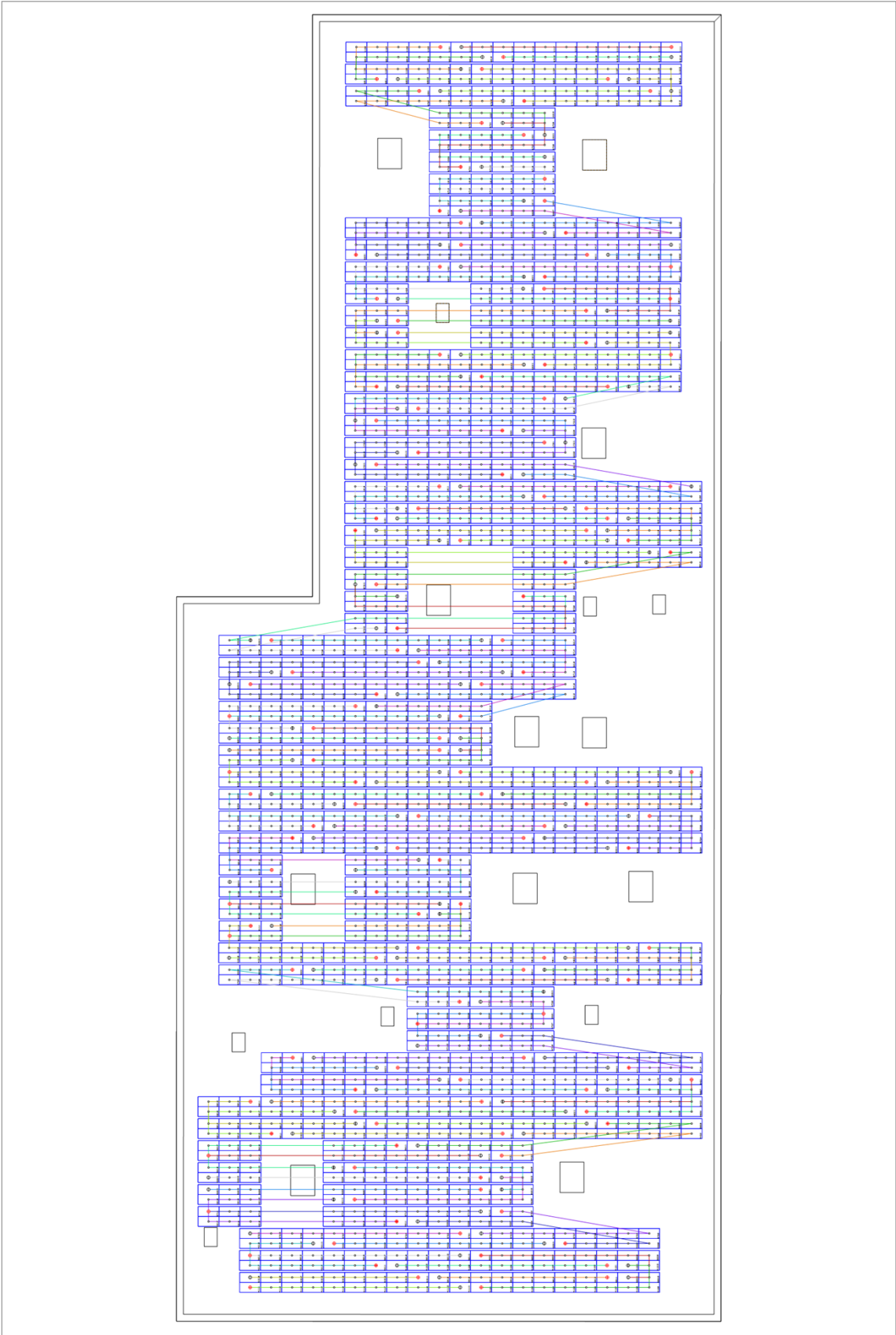


Figure: Arbitrary Building 01 - Mounting Surface North

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		LONGI Solar	LR4-72 HBD 435 M G2	1618	Piece
2	Inverter		GROWATT New Energy Co., Ltd.	MAX 100KTL3-X LV	6	Piece

Screenshots, 3D Design Environment



Figure: Screenshot01



Figure: Screenshot02