

Cor-Energy
Enterprise Point,
Altrincham Road, Manchester, M22 9AF
UK

Project Name: Hedge End Superstore

19/12/2024

Documentation

Customer Details

Company	Sainsbury's
Customer Number	
Contact person	
Address	
Phone	
Fax	
E-Mail	

Project Data

Project Name	Hedge End Superstore
Offer no.	
Project Designer	
Address	Sainsbury's, Tollbar Way, Hedge End, Southampton SO30 2UH

Sainsbury's

Project Description:
Rooftop PV

Project Overview



Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances

Climate Data	Southampton, GBR (2001 - 2020)
Values source	Meteonorm 8.2(i)
PV Generator Output	844.05 kWp
PV Generator Surface	3,968.2 m ²
Number of PV Modules	1986
Number of Inverters	9

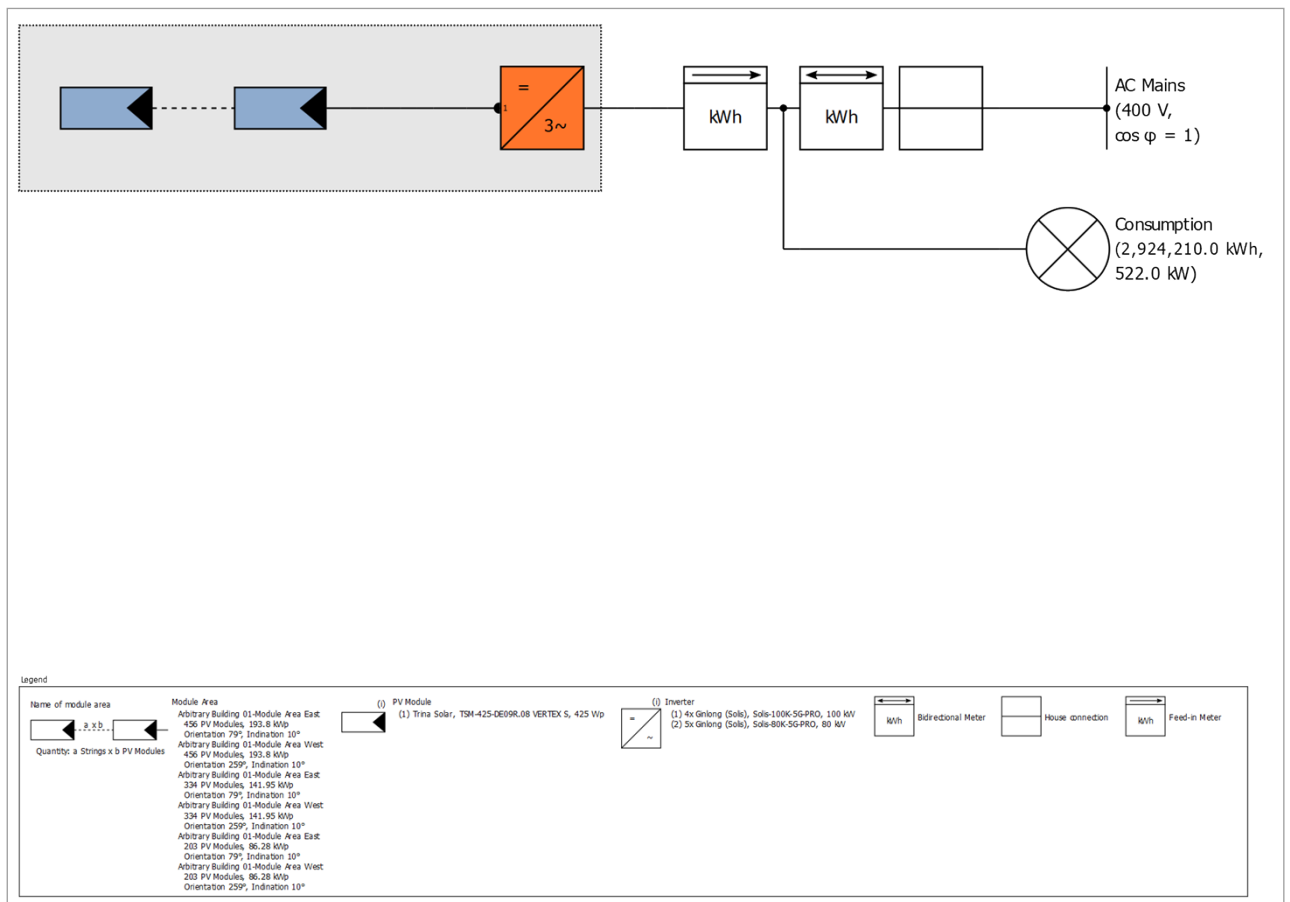


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	844.05 kWp
Spec. Annual Yield	1,025.61 kWh/kWp
Performance Ratio (PR)	91.82 %
Yield Reduction due to Shading	0.8 %
PV Generator Energy (AC grid)	865,734 kWh/Year
Own Consumption	791,208 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	74,526 kWh/Year
Own Power Consumption	91.4 %
CO ₂ Emissions avoided	194,767 kg / year
Level of Self-sufficiency	27.1 %

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
Start of Operation	01/01/2025

Climate Data	
Location	Southampton, GBR (2001 - 2020)
Values source	Meteonorm 8.2(i)
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Reindl reduced
- Irradiance onto tilted surface	Perez

Consumption	
Total Consumption	2924210 kWh
Hedge End 16.10.23 - 15.10.24	2924210 kWh
Load Peak	522 kW

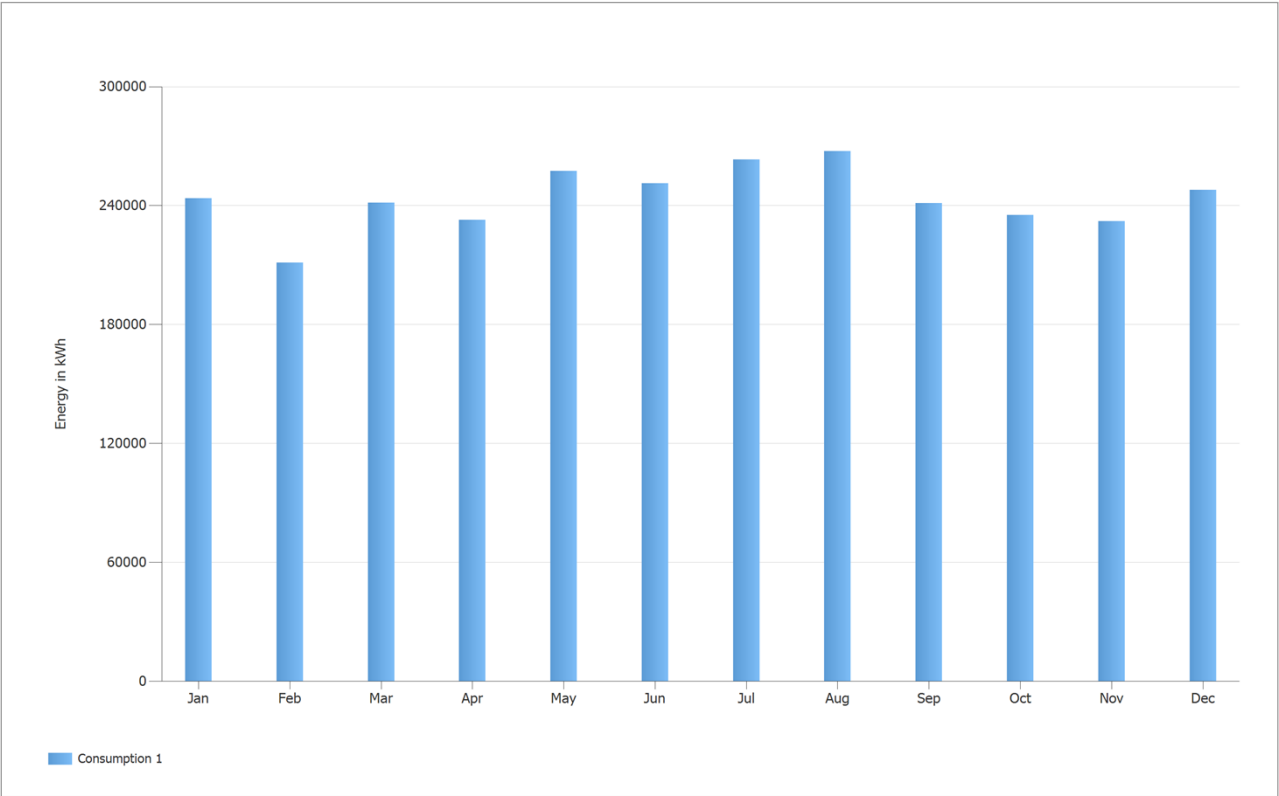


Figure: Consumption

Module Areas

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

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

Name	Arbitrary Building 01-Module Area East
PV Modules	456 x TSM-425-DE09R.08 VERTEX S (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	East 79 °
Installation Type	Mounted - Roof
PV Generator Surface	911.1 m ²



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

Degradation of Module, 1. Module Area - Arbitrary Building 01-Module Area East

Characteristic curve	Exponential
Remaining power (power output) after 1 year	99 %
Remaining power (power output) after 30 years	87.4 %

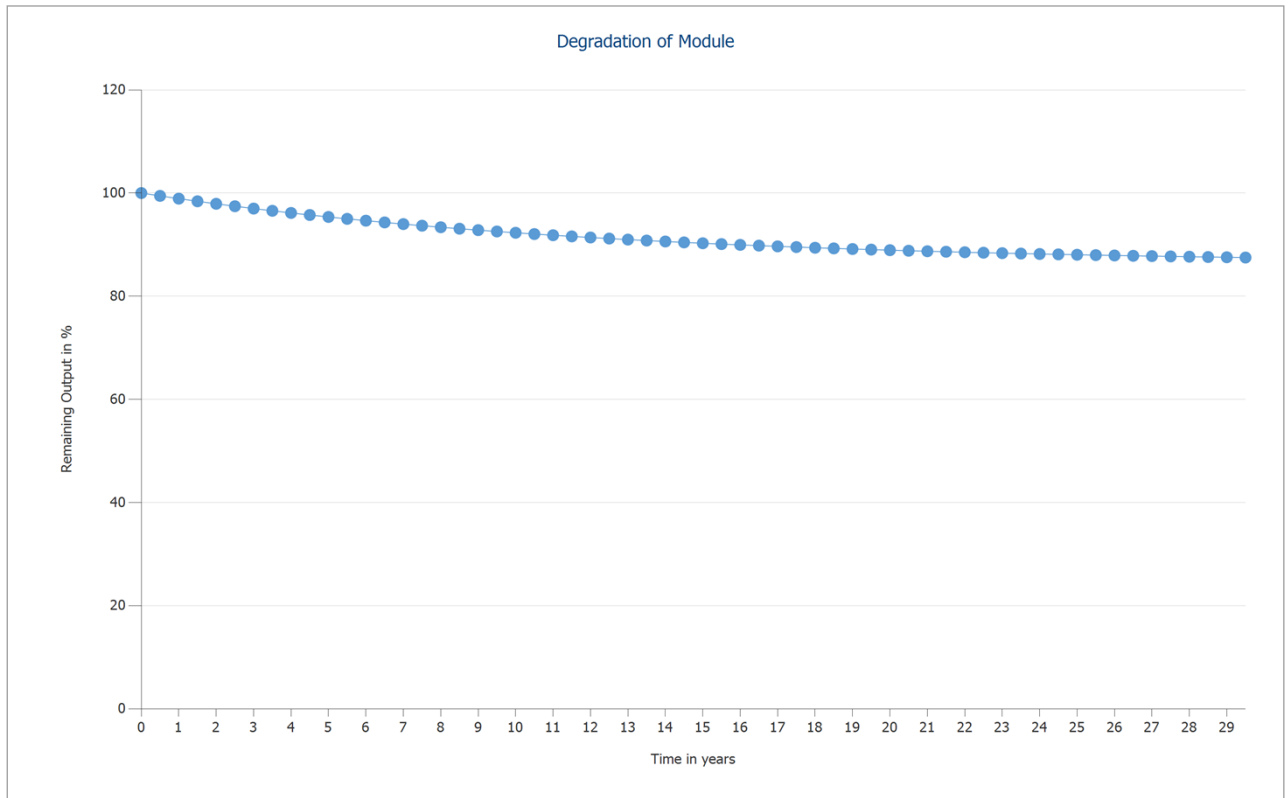


Figure: Degradation of Module, 1. Module Area - Arbitrary Building 01-Module Area East

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

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

Name	Arbitrary Building 01-Module Area West
PV Modules	456 x TSM-425-DE09R.08 VERTEX S (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	West 259 °
Installation Type	Mounted - Roof
PV Generator Surface	911.1 m²

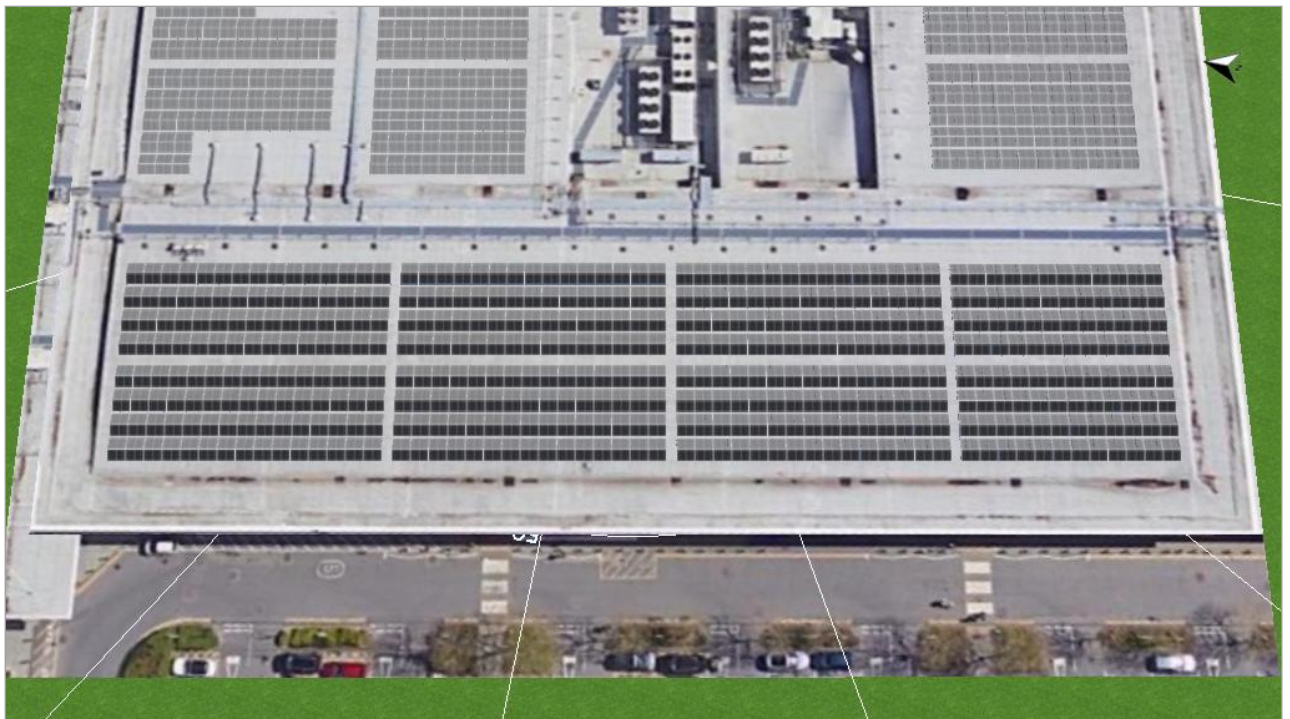


Figure: 2. Module Area - Arbitrary Building 01-Module Area West

Degradation of Module, 2. Module Area - Arbitrary Building 01-Module Area West

Characteristic curve	Exponential
Remaining power (power output) after 1 year	99 %
Remaining power (power output) after 30 years	87.4 %

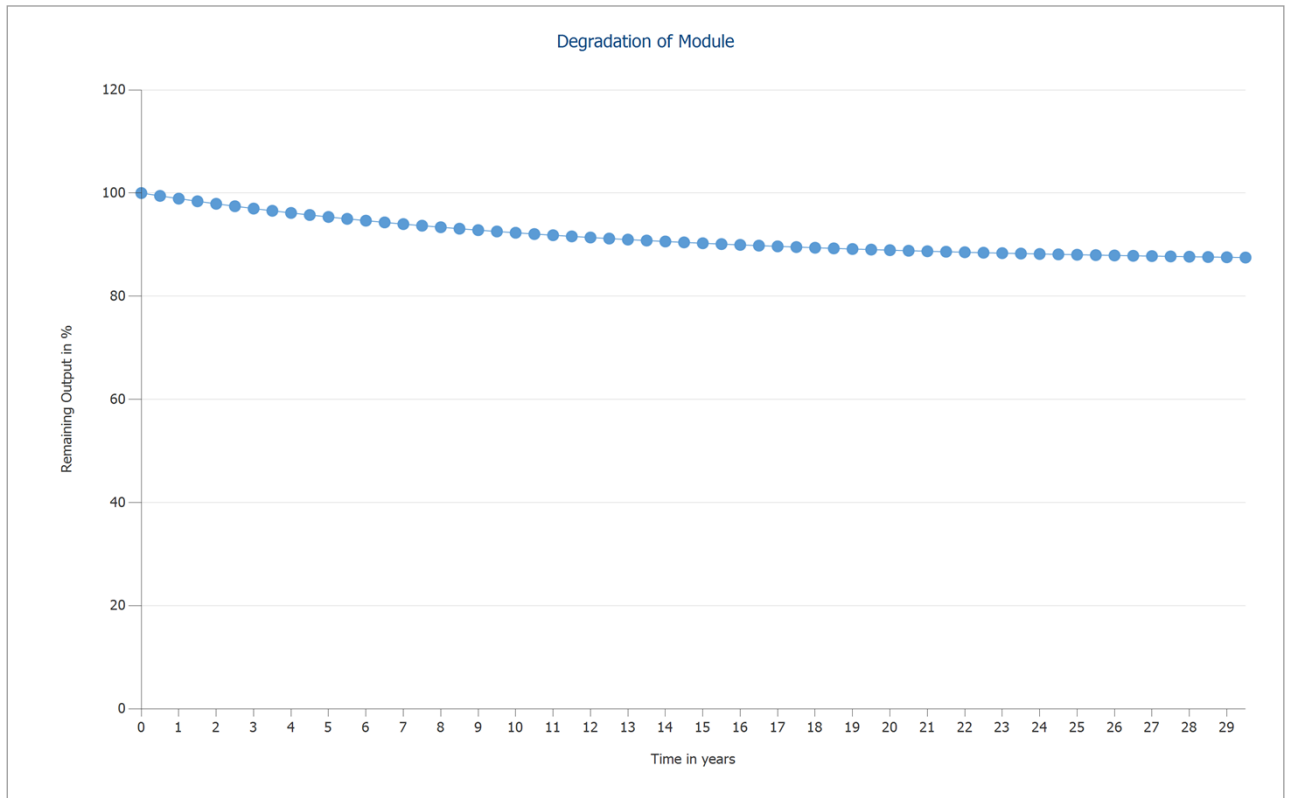


Figure: Degradation of Module, 2. Module Area - Arbitrary Building 01-Module Area West

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

PV Generator, 3. Module Area - Arbitrary Building 01-Module Area East

Name	Arbitrary Building 01-Module Area East
PV Modules	334 x TSM-425-DE09R.08 VERTEX S (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	East 79 °
Installation Type	Mounted - Roof
PV Generator Surface	667.4 m ²



Figure: 3. Module Area - Arbitrary Building 01-Module Area East

Degradation of Module, 3. Module Area - Arbitrary Building 01-Module Area East

Characteristic curve	Exponential
Remaining power (power output) after 1 year	99 %
Remaining power (power output) after 30 years	87.4 %

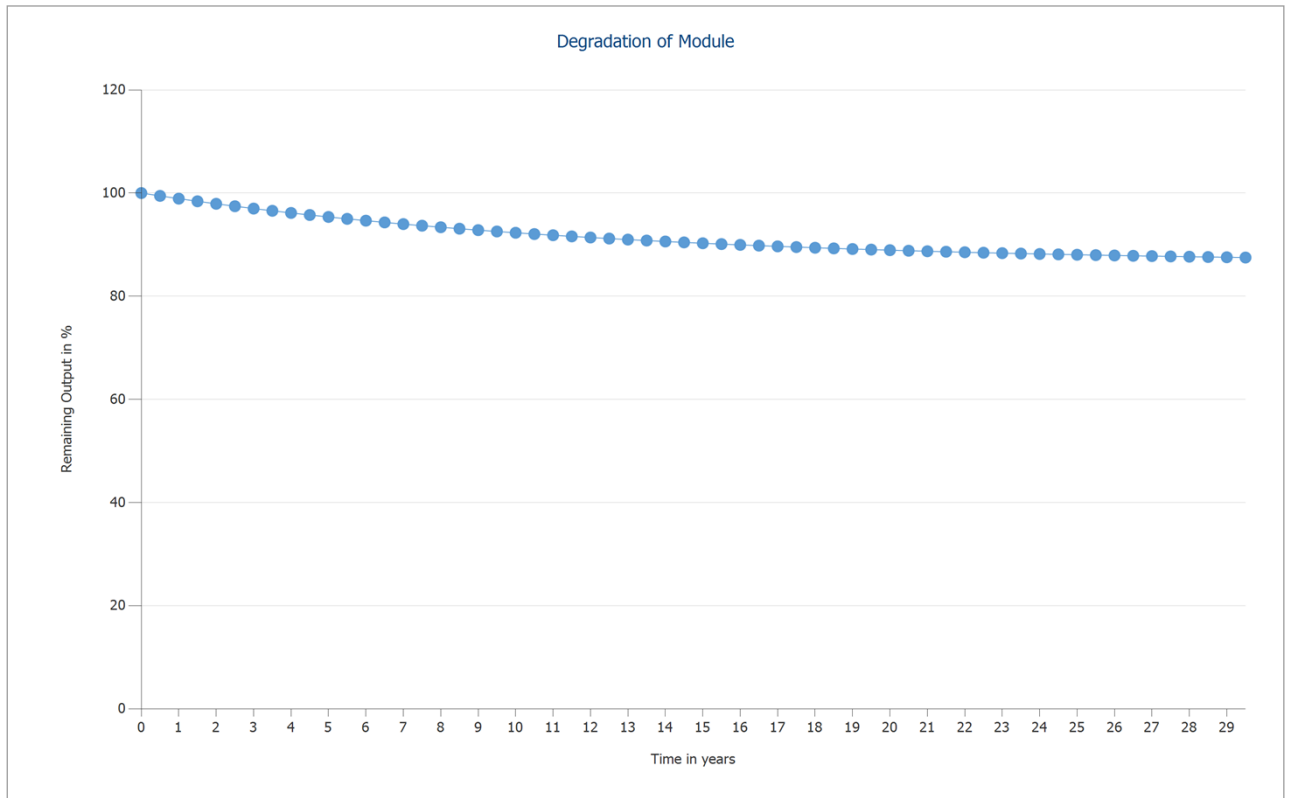


Figure: Degradation of Module, 3. Module Area - Arbitrary Building 01-Module Area East

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

PV Generator, 4. Module Area - Arbitrary Building 01-Module Area West

Name	Arbitrary Building 01-Module Area West
PV Modules	334 x TSM-425-DE09R.08 VERTEX S (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	West 259 °
Installation Type	Mounted - Roof
PV Generator Surface	667.4 m²



Figure: 4. Module Area - Arbitrary Building 01-Module Area West

Degradation of Module, 4. Module Area - Arbitrary Building 01-Module Area West

Characteristic curve	Exponential
Remaining power (power output) after 1 year	99 %
Remaining power (power output) after 30 years	87.4 %

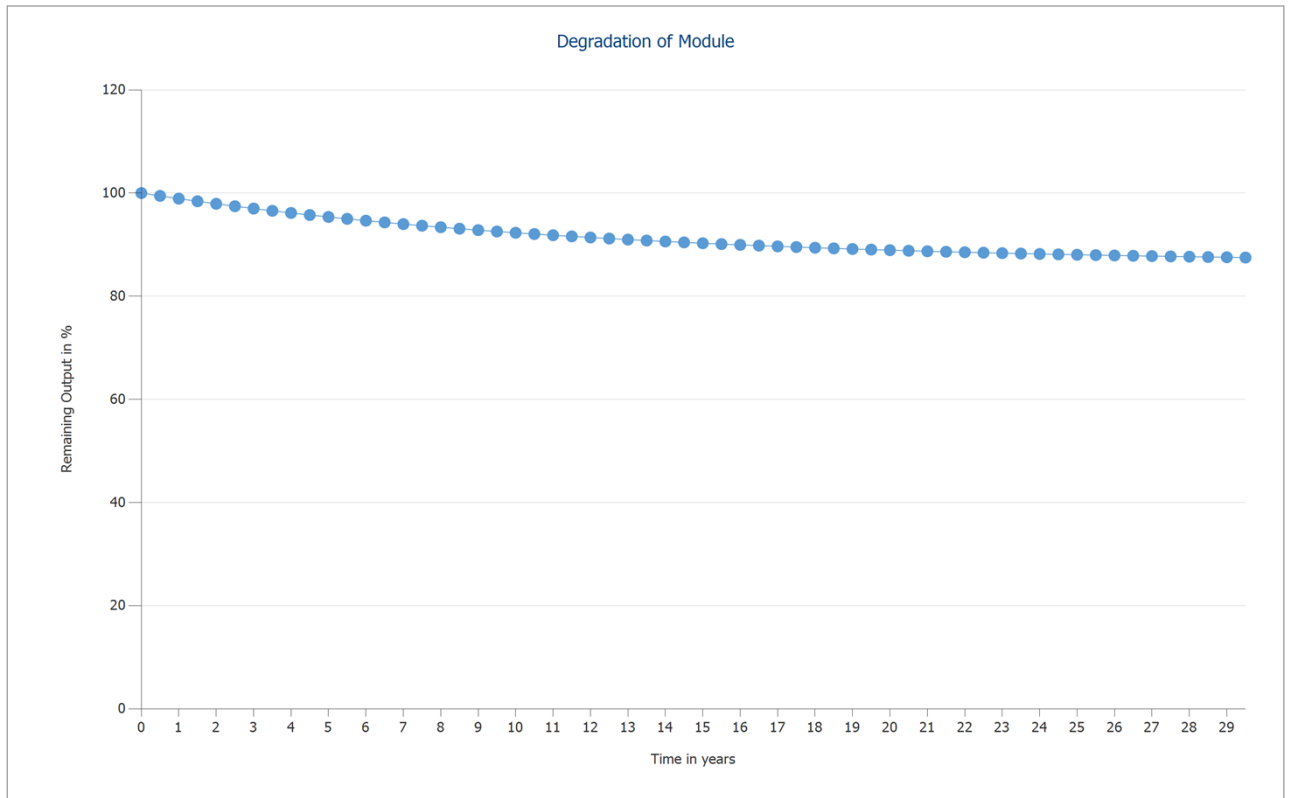


Figure: Degradation of Module, 4. Module Area - Arbitrary Building 01-Module Area West

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

PV Generator, 5. Module Area - Arbitrary Building 01-Module Area East

Name	Arbitrary Building 01-Module Area East
PV Modules	203 x TSM-425-DE09R.08 VERTEX S (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	East 79 °
Installation Type	Mounted - Roof
PV Generator Surface	405.6 m²

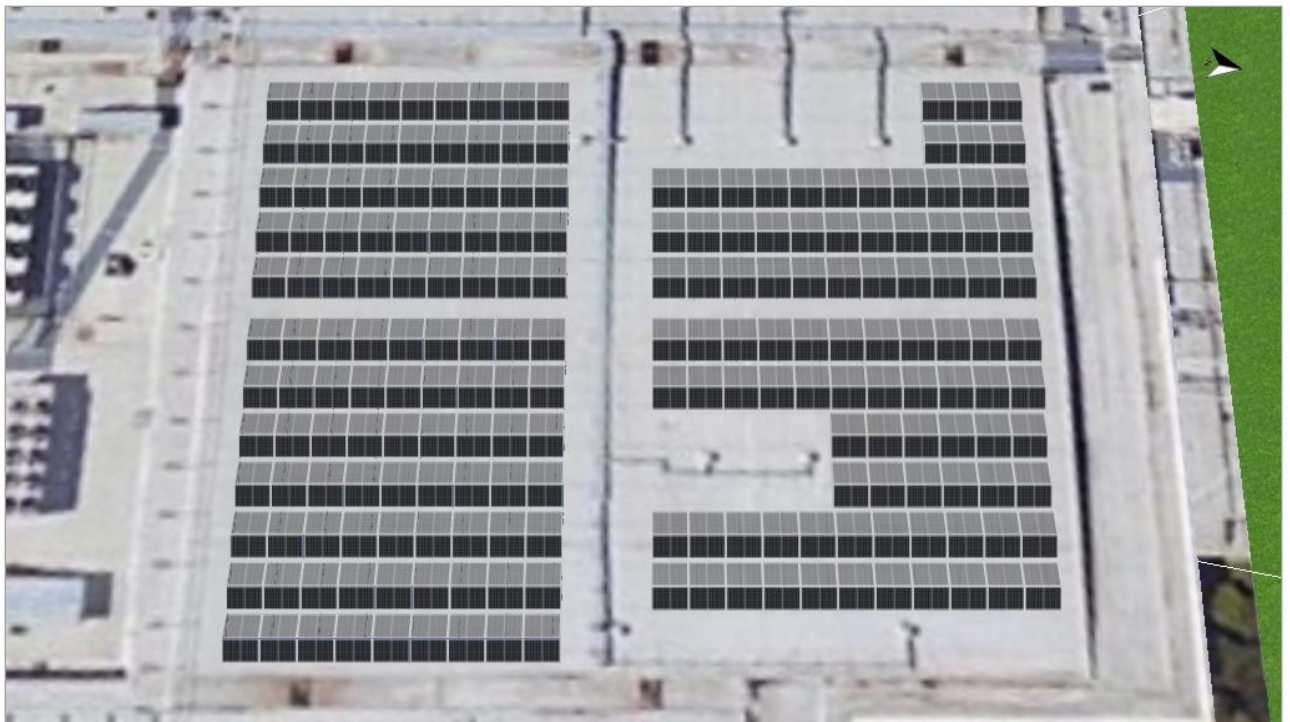


Figure: 5. Module Area - Arbitrary Building 01-Module Area East

Degradation of Module, 5. Module Area - Arbitrary Building 01-Module Area East

Characteristic curve	Exponential
Remaining power (power output) after 1 year	99 %
Remaining power (power output) after 30 years	87.4 %

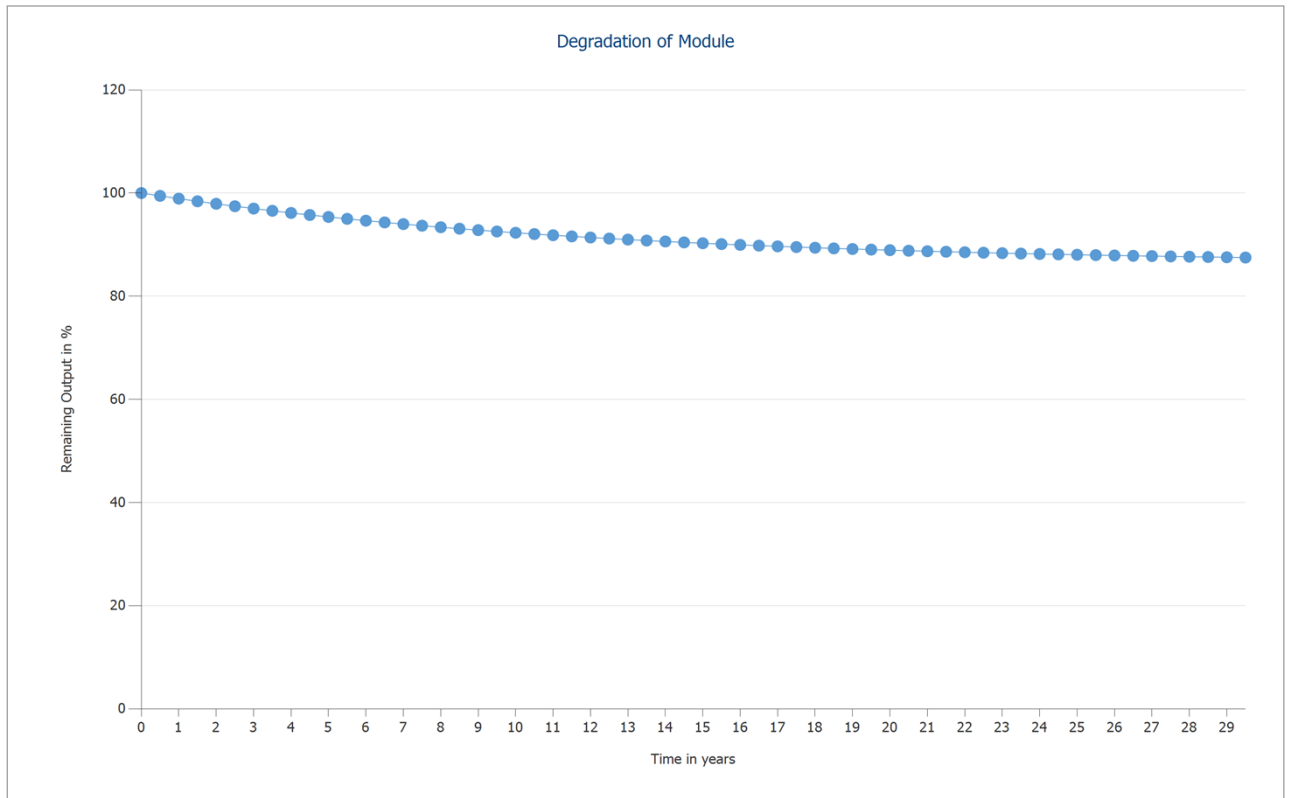


Figure: Degradation of Module, 5. Module Area - Arbitrary Building 01-Module Area East

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

PV Generator, 6. Module Area - Arbitrary Building 01-Module Area West

Name	Arbitrary Building 01-Module Area West
PV Modules	203 x TSM-425-DE09R.08 VERTEX S (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	West 259 °
Installation Type	Mounted - Roof
PV Generator Surface	405.6 m²

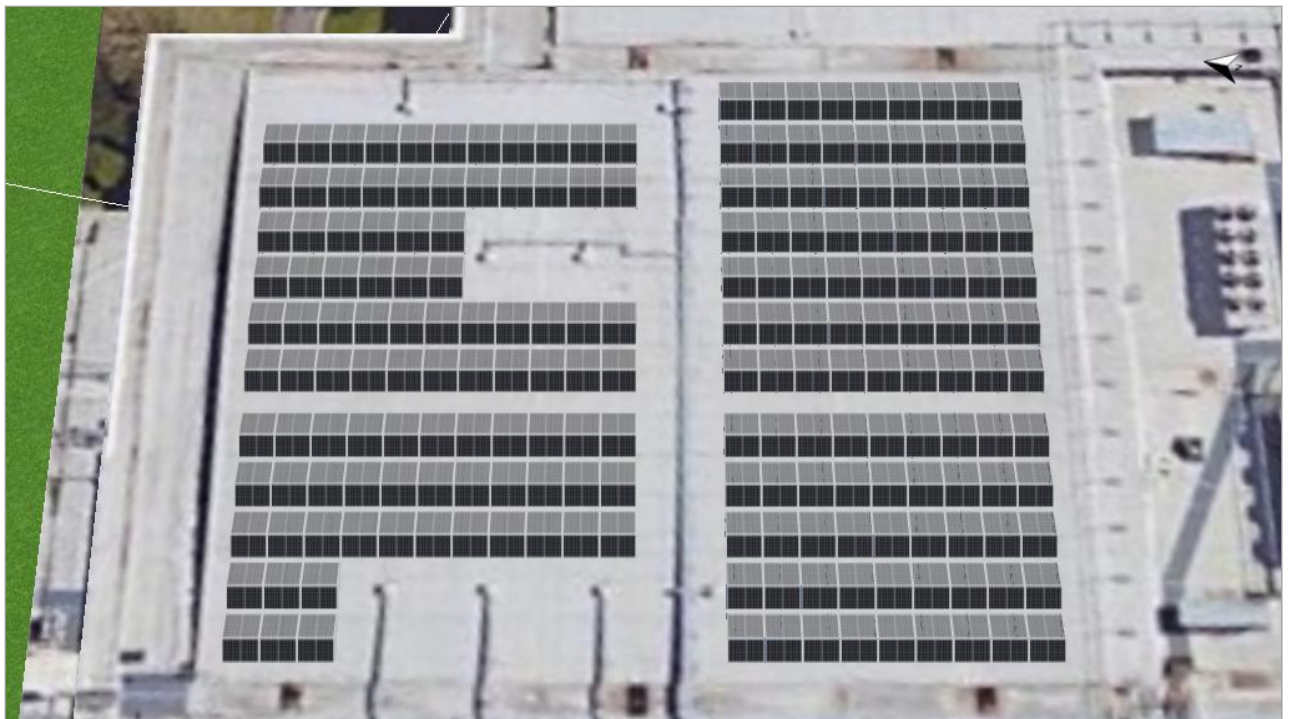


Figure: 6. Module Area - Arbitrary Building 01-Module Area West

Degradation of Module, 6. Module Area - Arbitrary Building 01-Module Area West

Characteristic curve	Exponential
Remaining power (power output) after 1 year	99 %
Remaining power (power output) after 30 years	87.4 %

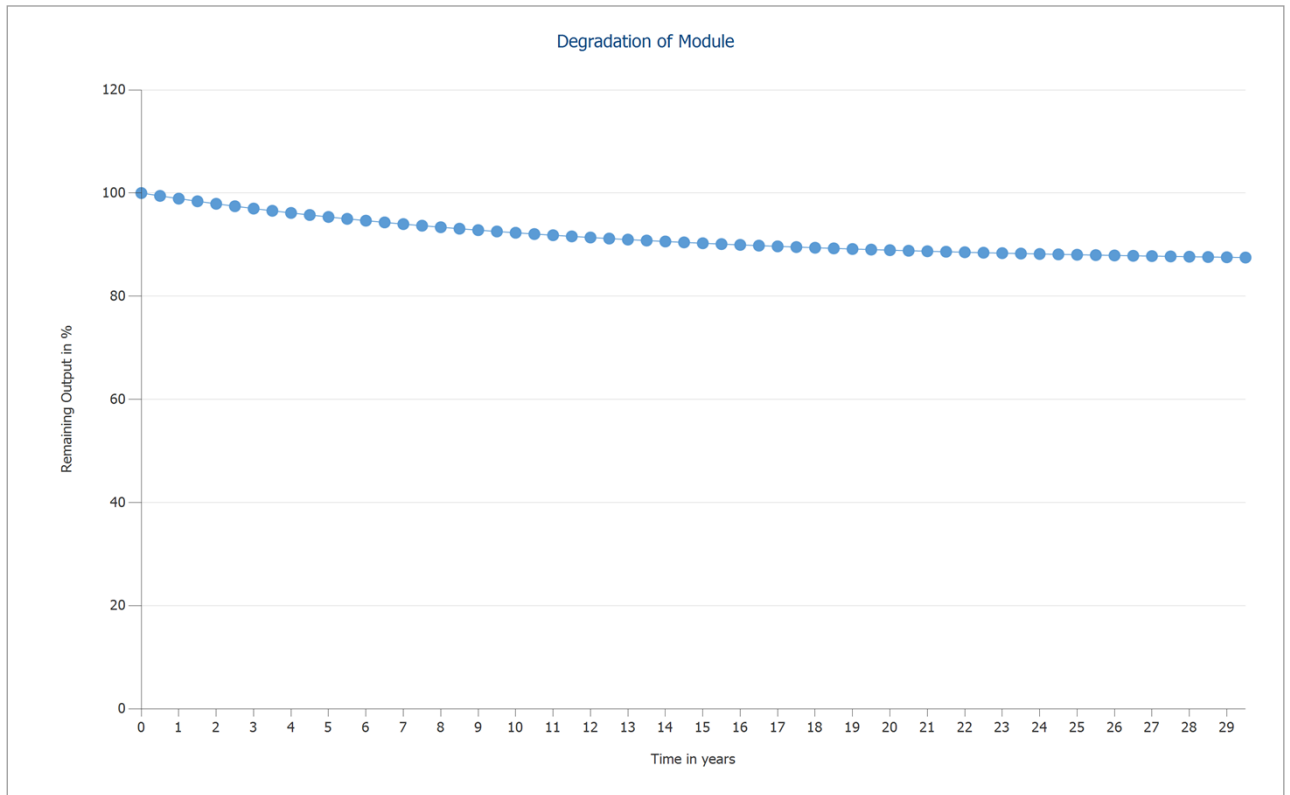


Figure: Degradation of Module, 6. Module Area - Arbitrary Building 01-Module Area West

Horizon Line, 3D Design

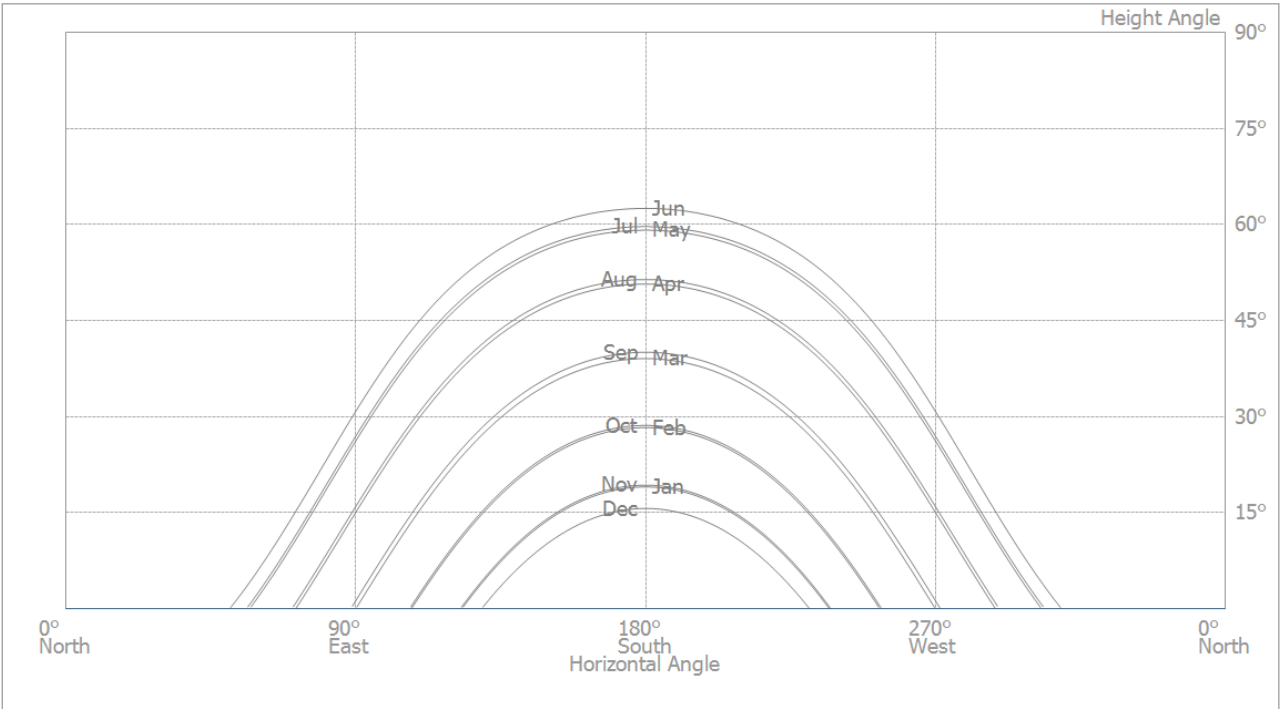


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Areas		Arbitrary Building 01-Module Area East + Arbitrary Building 01-Module Area West
Inverter 1		
Model	Solis-100K-5G-PRO (v1)	
Manufacturer	Ginlong (Solis)	
Quantity	4	
Sizing Factor	96.9 %	
Configuration	MPP 1: 2 x 15	
	MPP 2: 2 x 14	
	MPP 3: 2 x 14	
	MPP 4: 2 x 14	
	MPP 5: 2 x 15	
	MPP 6: 2 x 14	
	MPP 7: 2 x 14	
	MPP 8: 2 x 14	

Configuration 2

Module Areas	Arbitrary Building 01-Module Area East + Arbitrary Building 01-Module Area West
Inverter 1	
Model	Solis-80K-5G-PRO (v1)
Manufacturer	Ginlong (Solis)
Quantity	2
Sizing Factor	116.9 %
Configuration	MPP 1: 2 x 19
	MPP 2: 2 x 18
	MPP 3: 2 x 18
	MPP 4: 2 x 19
	MPP 5: 2 x 18
	MPP 6: 2 x 18
Inverter 2	
Model	Solis-80K-5G-PRO (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	121.1 %
Configuration	MPP 1: 2 x 19
	MPP 2: 2 x 19
	MPP 3: 2 x 19
	MPP 4: 2 x 19
	MPP 5: 2 x 19
	MPP 6: 2 x 19

Configuration 3

Module Areas	Arbitrary Building 01-Module Area East + Arbitrary Building 01-Module Area West
Inverter 1	
Model	Solis-80K-5G-PRO (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	110.5 %
Configuration	MPP 1: 2 x 18
	MPP 2: 2 x 17
	MPP 3: 2 x 17
	MPP 4: 2 x 18
	MPP 5: 2 x 17
	MPP 6: 2 x 17
Inverter 2	
Model	Solis-80K-5G-PRO (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	105.2 %
Configuration	MPP 1: 2 x 20
	MPP 2: 2 x 20
	MPP 3: 1 x 19
	MPP 4: 2 x 20
	MPP 5: 2 x 20
	MPP 6: 1 x 19

AC Mains

AC Mains

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

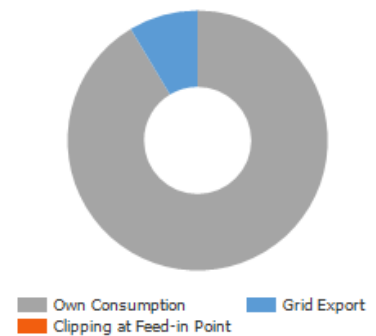
Simulation Results

Results Total System

PV System

PV Generator Output	844.05 kWp
Spec. Annual Yield	1,025.61 kWh/kWp
Performance Ratio (PR)	91.82 %
Yield Reduction due to Shading	0.8 %
PV Generator Energy (AC grid)	865,734 kWh/Year
Own Consumption	791,208 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	74,526 kWh/Year
Own Power Consumption	91.4 %
CO ₂ Emissions avoided	194,767 kg / year

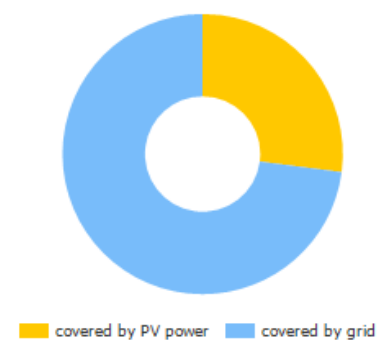
PV Generator Energy (AC grid)



Appliances

Appliances	2,924,210 kWh/Year
Standby Consumption (Inverter)	67 kWh/Year
Total Consumption	2,924,277 kWh/Year
covered by PV power	791,208 kWh/Year
covered by grid	2,133,069 kWh/Year
Solar Fraction	27.1 %

Total Consumption

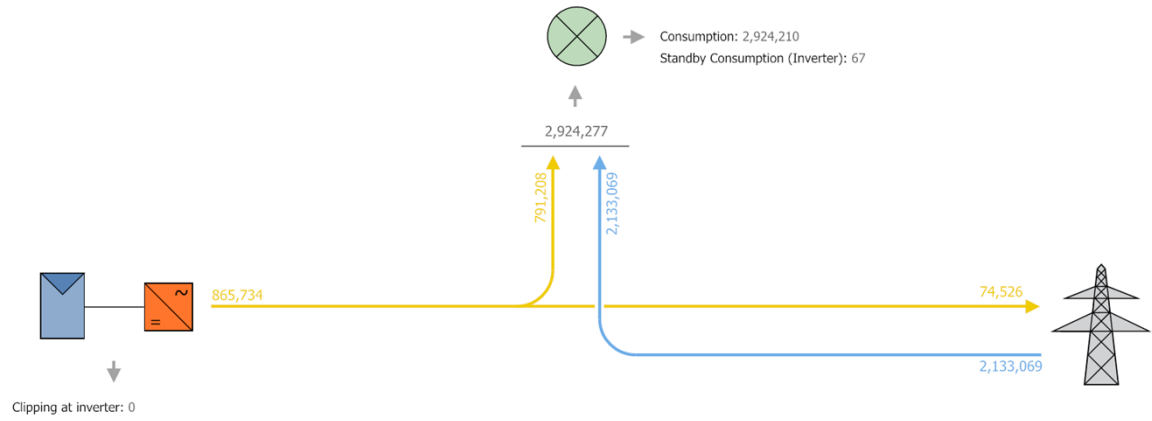


Level of Self-sufficiency

Total Consumption	2,924,277 kWh/Year
covered by grid	2,133,069 kWh/Year
Level of Self-sufficiency	27.1 %

Energy Flow Graph

Project: Hedge End Superstore



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

Figure: Energy flow

Hedge End Superstore

Client: Sainsbury's

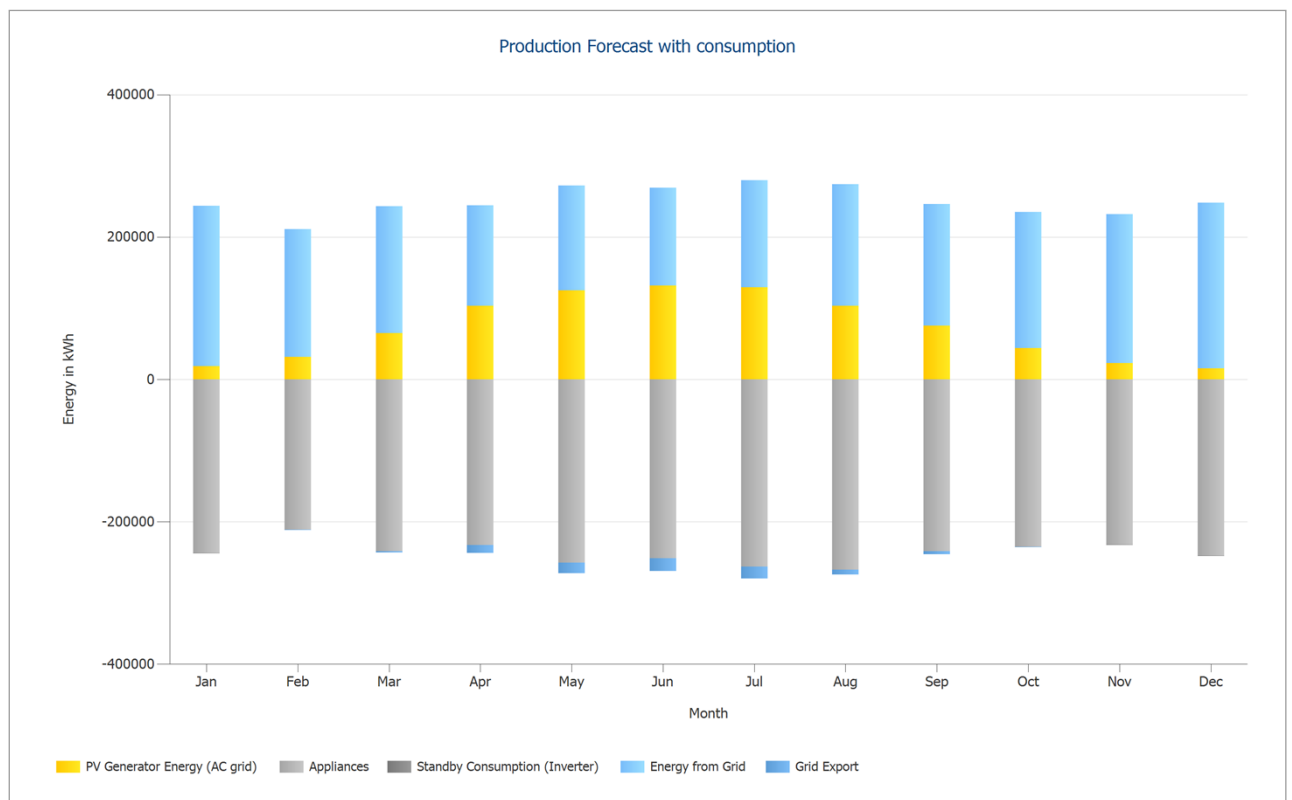


Figure: Production Forecast with consumption

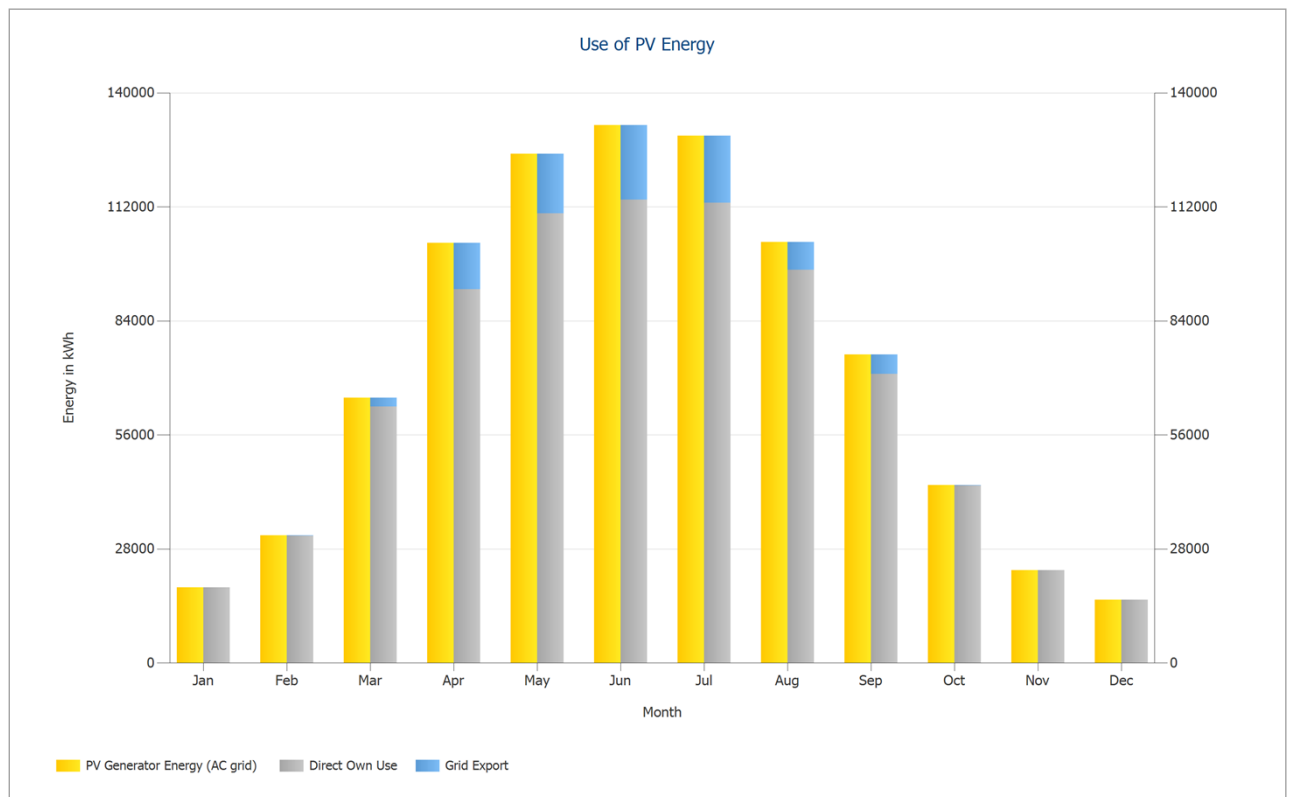


Figure: Use of PV Energy

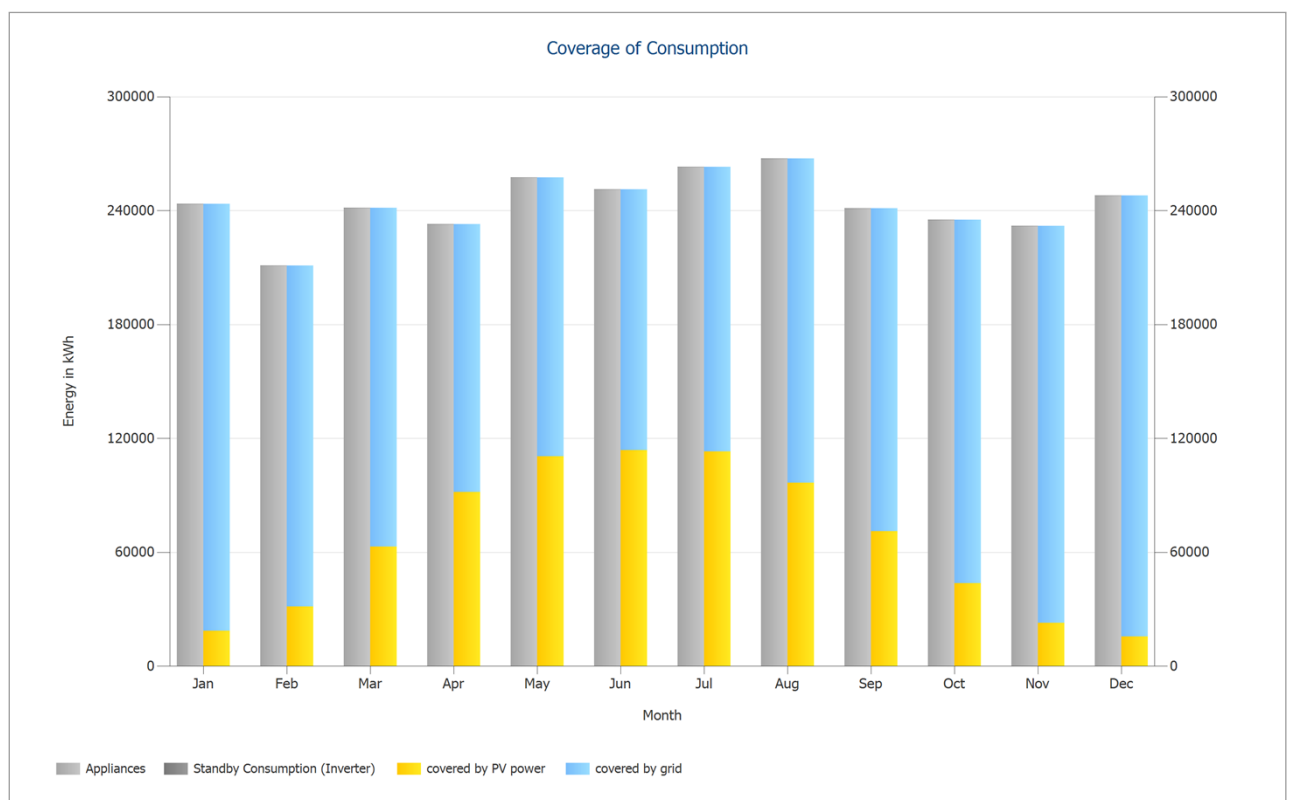


Figure: Coverage of Consumption

Results per Module Area

Arbitrary Building 01-Module Area East

PV Generator Output	193.80 kWp
PV Generator Surface	911.14 m ²
Global Radiation at the Module	1090.87 kWh/m ²
Global Radiation on Module without reflection	1093.81 kWh/m ²
Performance Ratio (PR)	91.98 %
PV Generator Energy (AC grid)	195151.75 kWh/Year
Spec. Annual Yield	1006.97 kWh/kWp

Arbitrary Building 01-Module Area West

PV Generator Output	193.80 kWp
PV Generator Surface	911.14 m ²
Global Radiation at the Module	1135.29 kWh/m ²
Global Radiation on Module without reflection	1138.17 kWh/m ²
Performance Ratio (PR)	91.80 %
PV Generator Energy (AC grid)	202672.39 kWh/Year
Spec. Annual Yield	1045.78 kWh/kWp

Arbitrary Building 01-Module Area East

PV Generator Output	141.95 kWp
PV Generator Surface	667.37 m ²
Global Radiation at the Module	1090.87 kWh/m ²
Global Radiation on Module without reflection	1093.81 kWh/m ²
Performance Ratio (PR)	91.90 %
PV Generator Energy (AC grid)	142813.78 kWh/Year
Spec. Annual Yield	1006.09 kWh/kWp

Hedge End Superstore

Client: Sainsbury's

Arbitrary Building 01-Module Area West

PV Generator Output	141.95 kWp
PV Generator Surface	667.37 m ²
Global Radiation at the Module	1135.29 kWh/m ²
Global Radiation on Module without reflection	1138.17 kWh/m ²
Performance Ratio (PR)	91.72 %
PV Generator Energy (AC grid)	148317.33 kWh/Year
Spec. Annual Yield	1044.86 kWh/kWp

Arbitrary Building 01-Module Area East

PV Generator Output	86.28 kWp
PV Generator Surface	405.62 m ²
Global Radiation at the Module	1090.87 kWh/m ²
Global Radiation on Module without reflection	1093.81 kWh/m ²
Performance Ratio (PR)	91.81 %
PV Generator Energy (AC grid)	86719.44 kWh/Year
Spec. Annual Yield	1005.15 kWh/kWp

Arbitrary Building 01-Module Area West

PV Generator Output	86.28 kWp
PV Generator Surface	405.62 m ²
Global Radiation at the Module	1135.29 kWh/m ²
Global Radiation on Module without reflection	1138.17 kWh/m ²
Performance Ratio (PR)	91.63 %
PV Generator Energy (AC grid)	90059.71 kWh/Year
Spec. Annual Yield	1043.87 kWh/kWp

Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	74,113 kWh/Year
PV Generator Output	844.1 kWp
Start of Operation of the System	01/01/2025
Assessment Period	25 Years
Interest on Capital	0 %

Economic Parameters

Internal Rate of Return (IRR)	24.37 %
Accrued Cash Flow (Cash Balance)	5,806,519.19 £
Amortization Period	4.4 Years
Electricity Production Costs	0.0372 £/kWh

Payment Overview

Specific Investment Costs	953.50 £/kWp
Investment Costs	804,801.00 £
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	0.00 £/Year
First year savings	173,048.83 £/Year

SAINSBURY'S 22p (Example)

Energy Price	0.22 £/kWh
Inflation Rate for Energy Price	4 %/Year

Hedge End Superstore

Client: Sainsbury's

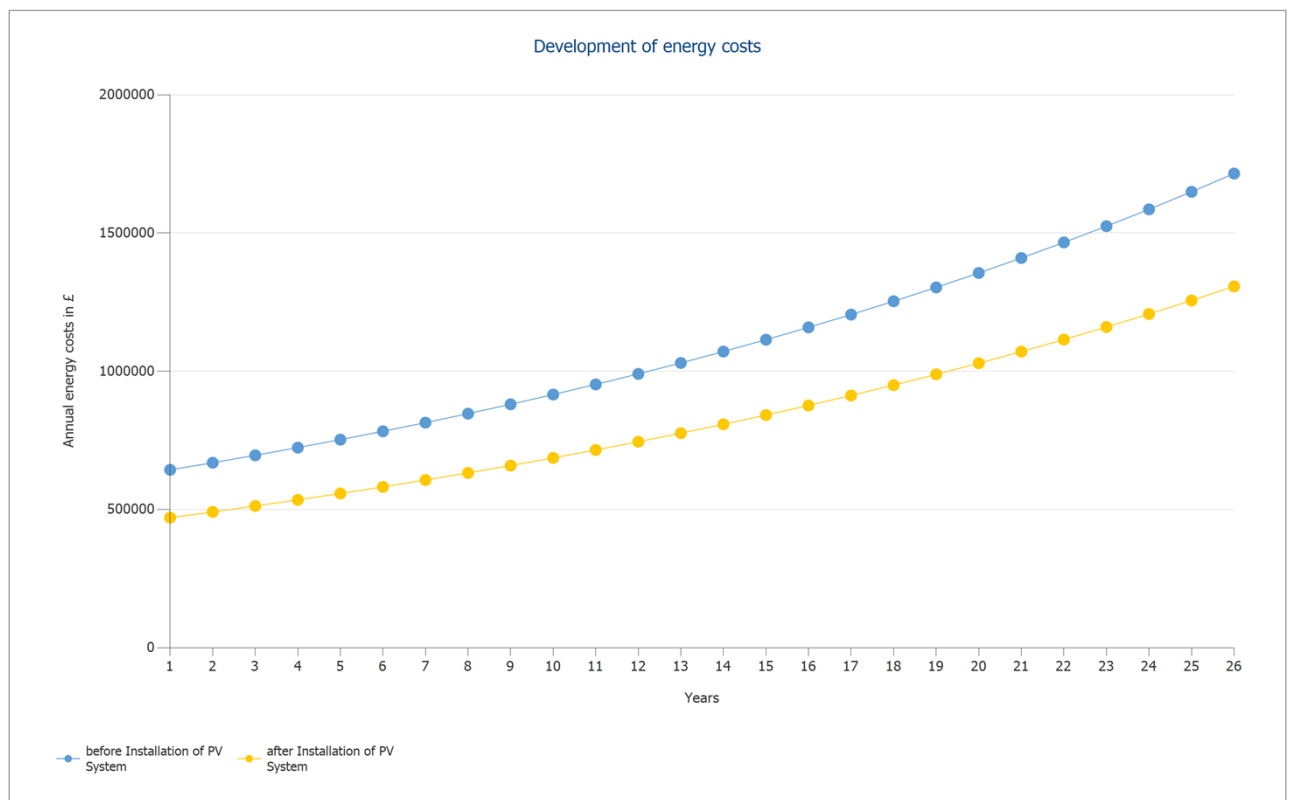


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
Investments	-£804,801.00	£0.00	£0.00	£0.00	£0.00
Electricity Savings	£173,048.83	£178,085.34	£183,403.53	£189,011.24	£194,916.85
Annual Cash Flow	-£631,752.17	£178,085.34	£183,403.53	£189,011.24	£194,916.85
Accrued Cash Flow (Cash Balance)	-£631,752.17	-£453,666.83	-£270,263.30	-£81,252.06	£113,664.79

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	£201,128.96	£207,656.99	£214,510.74	£221,700.35	£229,236.79
Annual Cash Flow	£201,128.96	£207,656.99	£214,510.74	£221,700.35	£229,236.79
Accrued Cash Flow (Cash Balance)	£314,793.74	£522,450.73	£736,961.47	£958,661.82	£1,187,898.61

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	£237,131.22	£245,395.78	£254,042.78	£263,085.53	£272,537.32
Annual Cash Flow	£237,131.22	£245,395.78	£254,042.78	£263,085.53	£272,537.32
Accrued Cash Flow (Cash Balance)	£1,425,029.83	£1,670,425.61	£1,924,468.39	£2,187,553.92	£2,460,091.25

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	£282,413.07	£292,727.23	£303,495.81	£314,735.34	£326,462.49
Annual Cash Flow	£282,413.07	£292,727.23	£303,495.81	£314,735.34	£326,462.49
Accrued Cash Flow (Cash Balance)	£2,742,504.32	£3,035,231.55	£3,338,727.36	£3,653,462.69	£3,979,925.18

Cash flow

	Year 21	Year 22	Year 23	Year 24	Year 25
Investments	£0.00	£0.00	£0.00	£0.00	£0.00
Electricity Savings	£338,695.52	£351,452.98	£364,754.40	£378,620.07	£393,071.04
Annual Cash Flow	£338,695.52	£351,452.98	£364,754.40	£378,620.07	£393,071.04
Accrued Cash Flow (Cash Balance)	£4,318,620.70	£4,670,073.68	£5,034,828.08	£5,413,448.15	£5,806,519.19

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

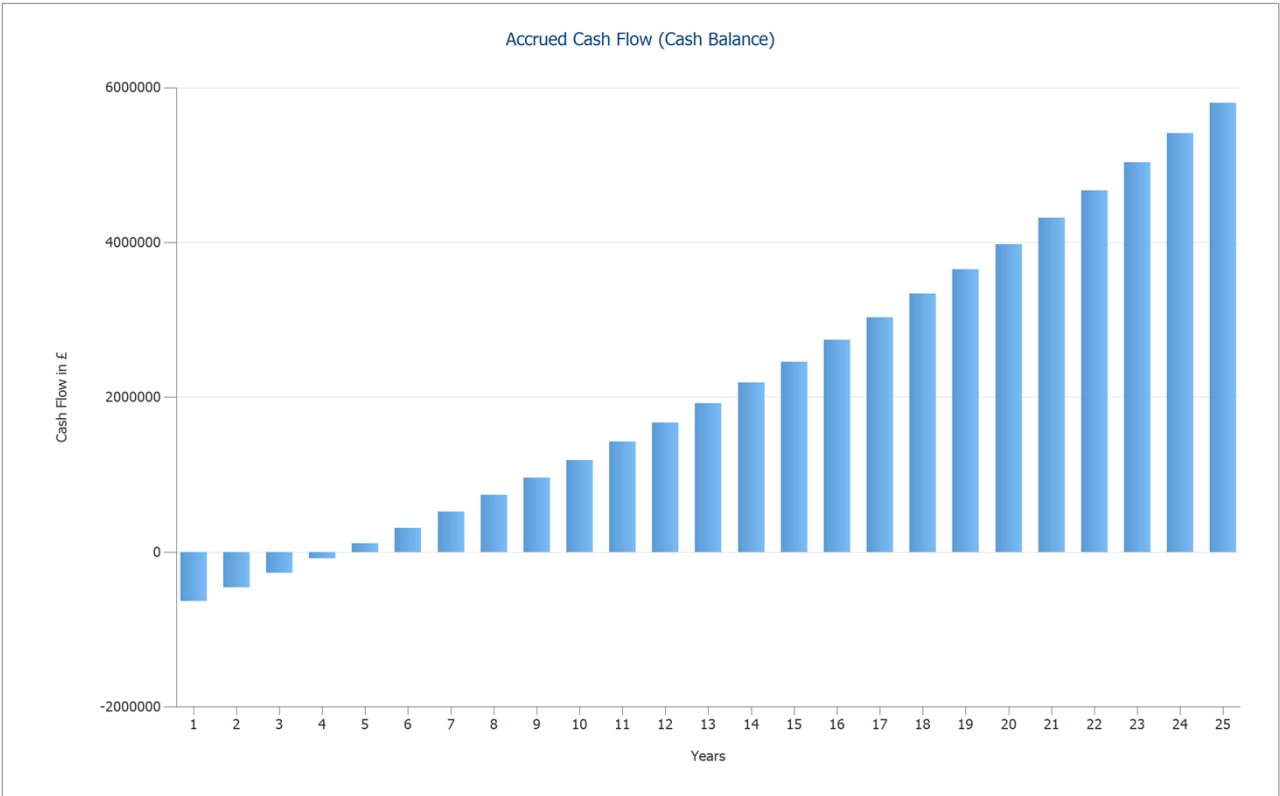


Figure: Accrued Cash Flow (Cash Balance)

Plans and parts list

Circuit Diagram

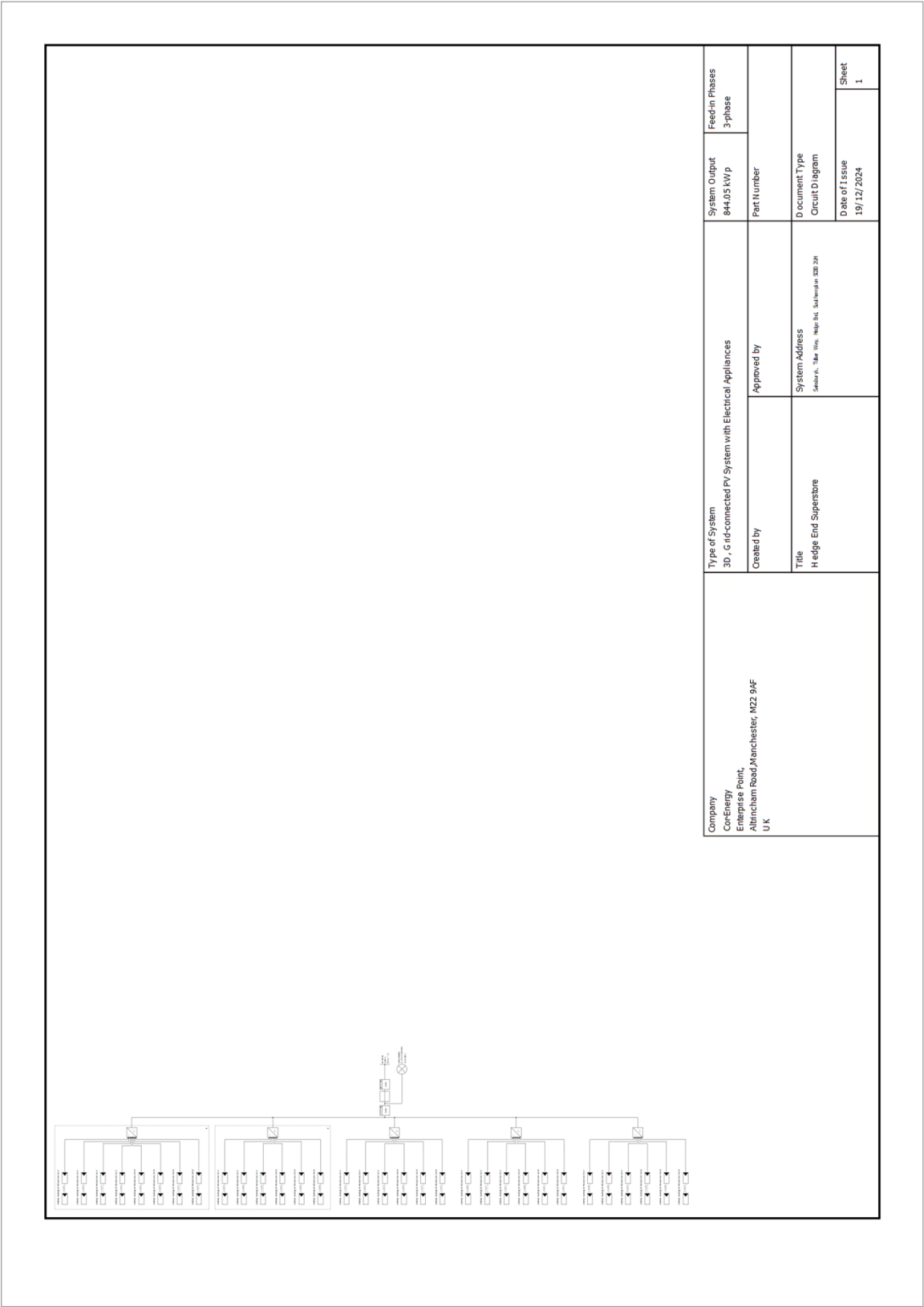


Figure: Circuit Diagram

Overview plan

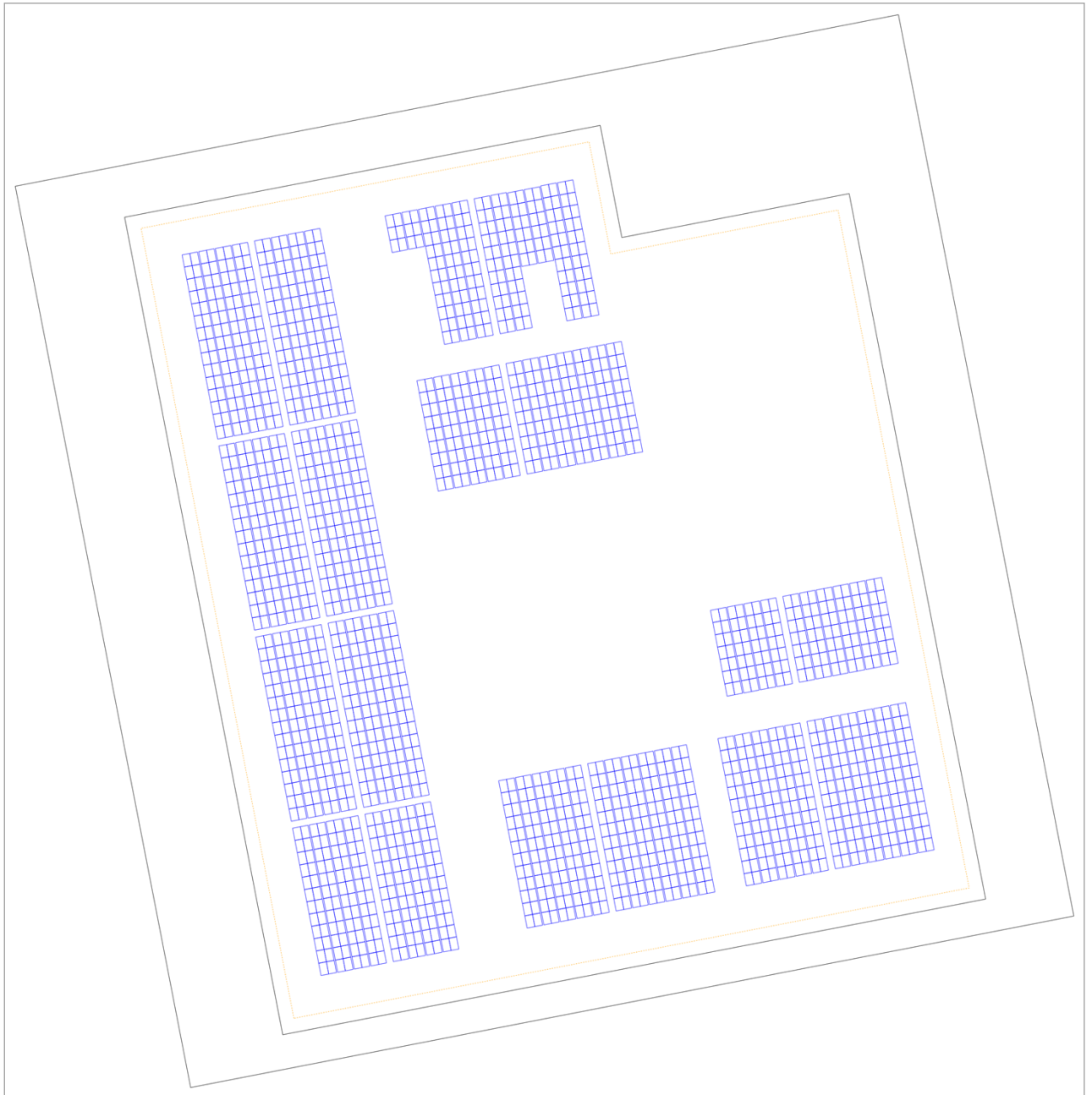


Figure: Overview plan

Dimensioning Plan

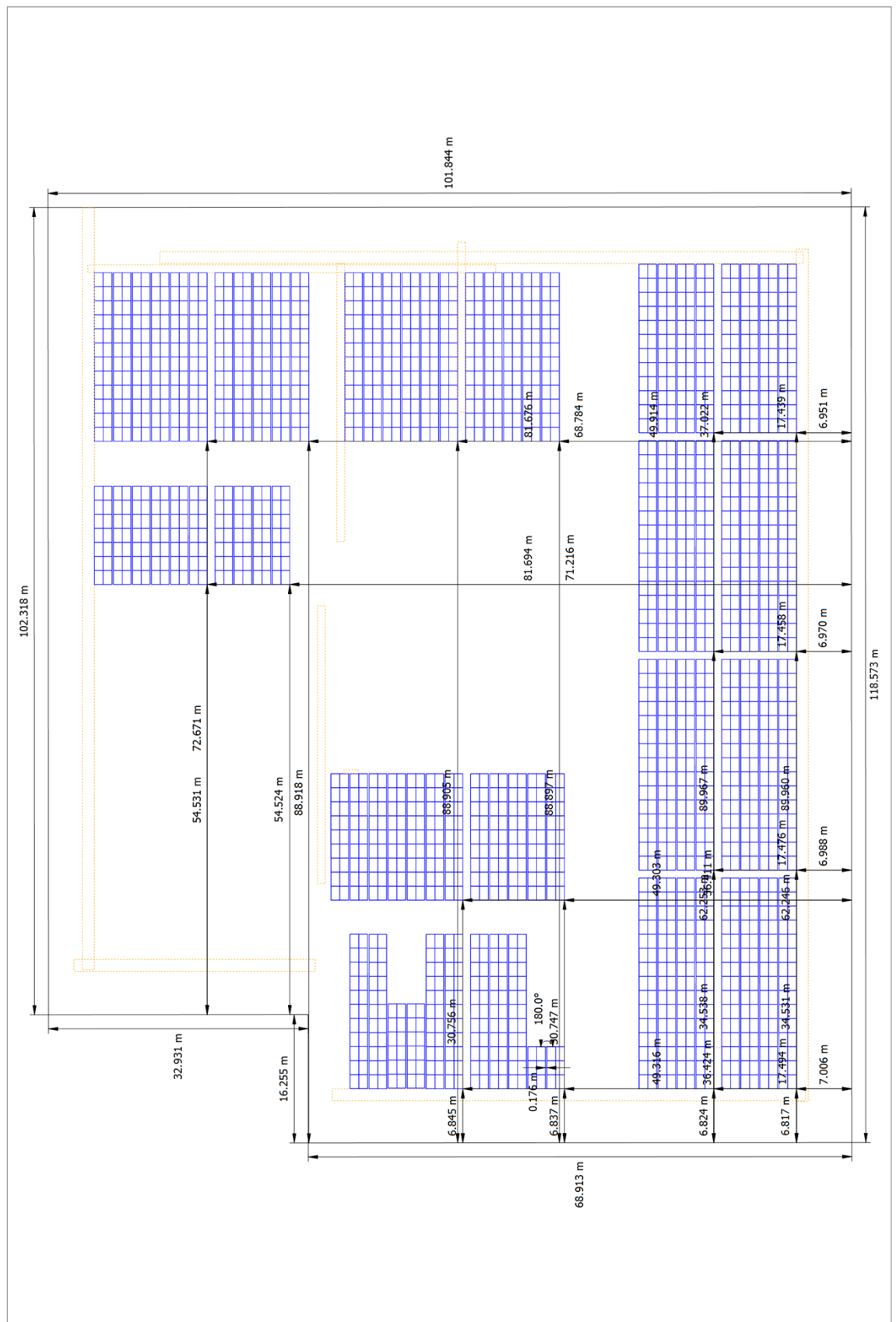


Figure: Arbitrary Building 01 - Mounting Surface West

String Plan

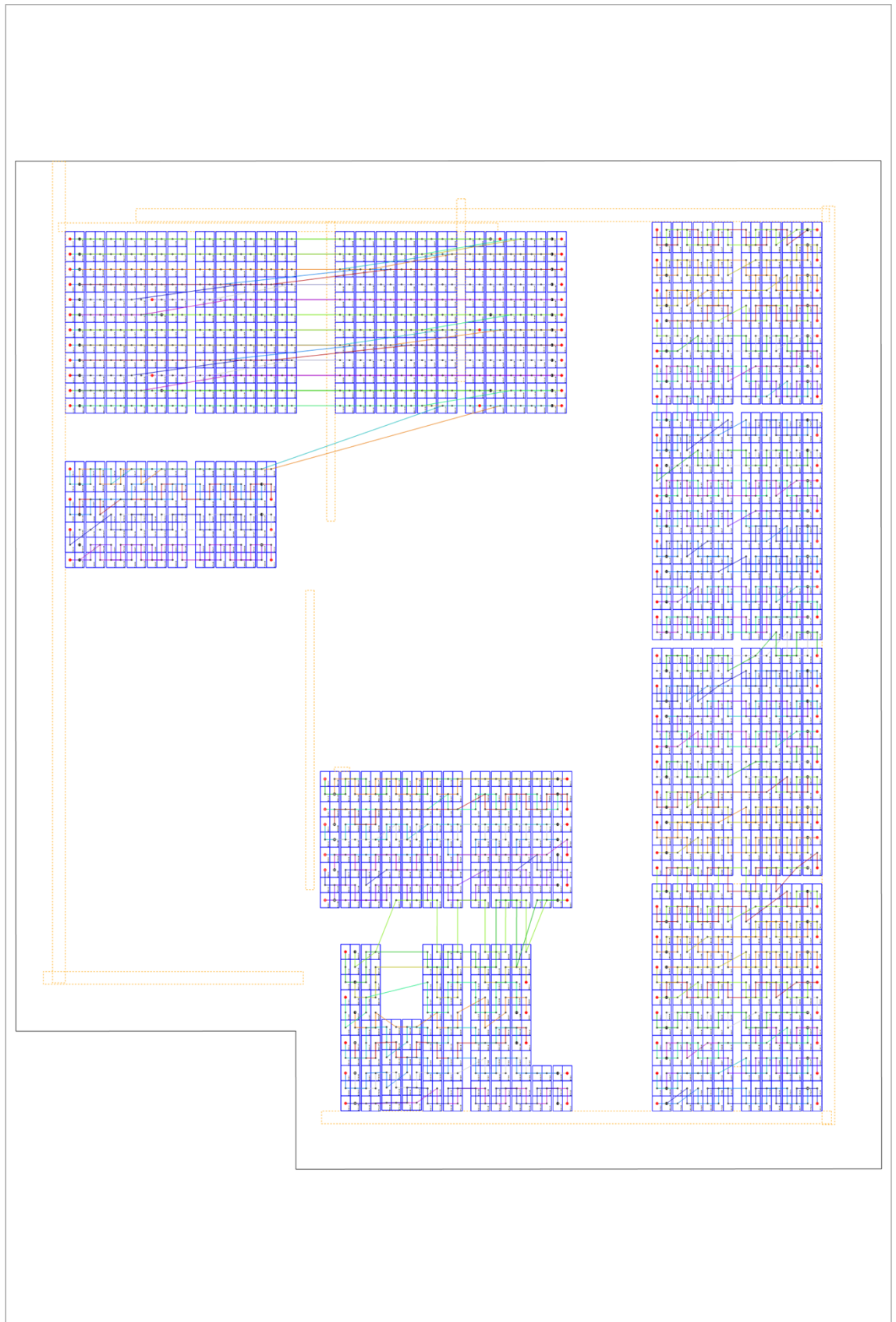


Figure: Arbitrary Building 01 - Mounting Surface West

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		Trina Solar	TSM-425-DE09R.08 VERTEX S	1986	Piece
2	Inverter		Ginlong (Solis)	Solis-100K-5G-PRO	4	Piece
3	Inverter		Ginlong (Solis)	Solis-80K-5G-PRO	5	Piece
4	Components			Feed-in Meter	1	Piece
5	Components			House connection	1	Piece
6	Components			Bidirectional Meter	1	Piece