

Avrenim

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Xaverian College, Lower Park Road, Manchester

Project Name: Xaverian College

19/12/2023

Your PV system from Avrenim

Address of Installation

Xaverian College, Lower Park Road, Manchester



Project Overview

PV System

Grid-connected PV System with Electrical Appliances

Climate Data	Manchester-Ringway, GBR (1996 - 2015)
Values source	Meteonorm 8.1
PV Generator Output	141.16 kWp
PV Generator Surface	669.1 m ²
Number of PV Modules	259
Number of Inverters	2

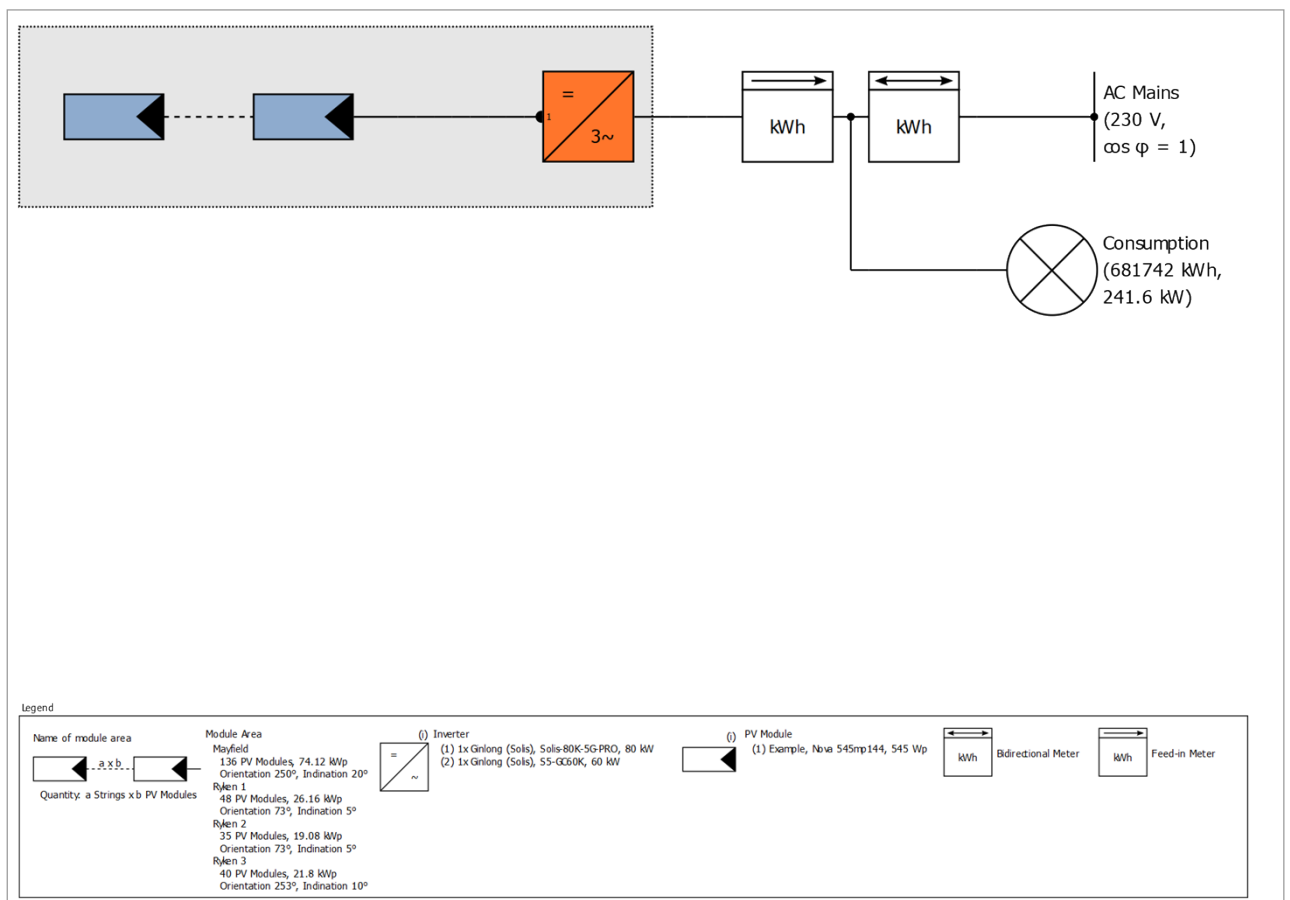


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	141.16 kWp
Spec. Annual Yield	748.21 kWh/kWp
Performance Ratio (PR)	80.03 %
PV Generator Energy (AC grid)	105,636 kWh/Year
Own Consumption	105,564 kWh/Year
Down-regulation at Feed-in Point	0 kWh/Year
Grid Feed-in	72 kWh/Year
Own Power Consumption	99.9 %
CO ₂ Emissions avoided	49,638 kg / year
Level of Self-sufficiency	15.5 %

Financial Analysis

Your Gain

Total investment costs	108,117.00 £
Internal Rate of Return (IRR)	21.41 %
Amortization Period	4.9 Years
Electricity Production Costs	0.0814 £/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	Grid-connected PV System with Electrical Appliances
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Climate Data

Location	Manchester-Ringway, GBR (1996 - 2015)
Values source	Meteonorm 8.1
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Consumption

Total Consumption	681742 kWh
XC Mayfield, Ryken	681742 kWh
Load Peak	241.6 kW

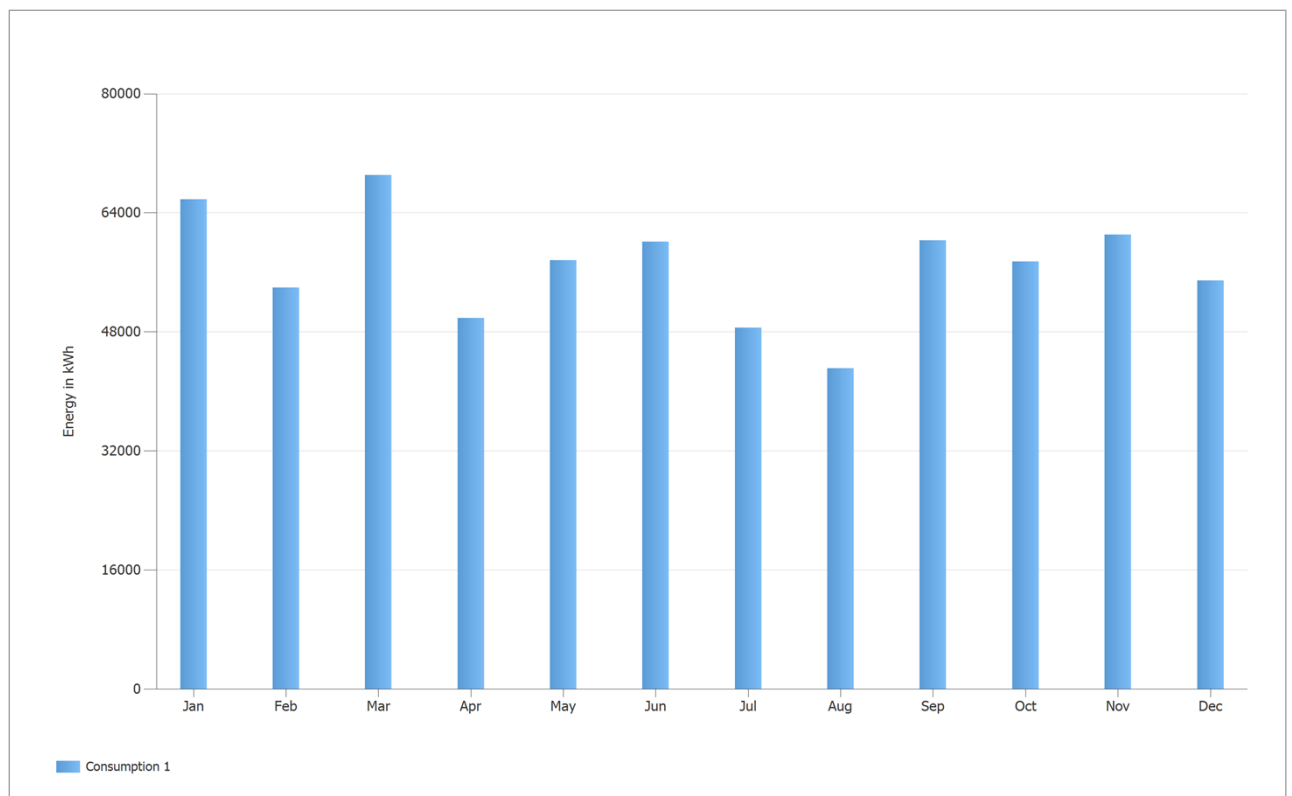


Figure: Consumption

Module Areas

1. Module Area - Mayfield

PV Generator, 1. Module Area - Mayfield

Name	Mayfield
PV Modules	136 x Nova 545mp144 (v4)
Manufacturer	Example
Inclination	20 °
Orientation	West 250 °
Installation Type	Roof parallel
PV Generator Surface	351.3 m ²

2. Module Area - Ryken 1

PV Generator, 2. Module Area - Ryken 1

Name	Ryken 1
PV Modules	48 x Nova 545mp144 (v4)
Manufacturer	Example
Inclination	5 °
Orientation	East 73 °
Installation Type	Roof parallel
PV Generator Surface	124.0 m ²

3. Module Area - Ryken 2

PV Generator, 3. Module Area - Ryken 2

Name	Ryken 2
PV Modules	35 x Nova 545mp144 (v4)
Manufacturer	Example
Inclination	5 °
Orientation	East 73 °
Installation Type	Roof parallel
PV Generator Surface	90.4 m ²

4. Module Area - Ryken 3

PV Generator, 4. Module Area - Ryken 3

Name	Ryken 3
PV Modules	40 x Nova 545mp144 (v4)
Manufacturer	Example
Inclination	10 °
Orientation	West 253 °
Installation Type	Roof parallel
PV Generator Surface	103.3 m ²

Inverter configuration

Configuration 1

Module Area	Mayfield
Inverter 1	
Model	Solis-80K-5G-PRO (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	92.7 %
Configuration	MPP 1: 2 x 12
	MPP 2: 2 x 12
	MPP 3: 2 x 11
	MPP 4: 2 x 11
	MPP 5: 2 x 11
	MPP 6: 2 x 11

Configuration 2

Module Areas	Ryken 1 + Ryken 2 + Ryken 3
Inverter 1	
Model	S5-GC60K (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	111.7 %
Configuration	MPP 1: 2 x 12
	MPP 2: 2 x 12
	MPP 3: 1 x 7
	MPP 4: 2 x 14
	MPP 5: 2 x 10
	MPP 6: 2 x 10

AC Mains

AC Mains

Number of Phases	3
Mains voltage between phase and neutral	230 V
Displacement Power Factor (cos phi)	+/- 1

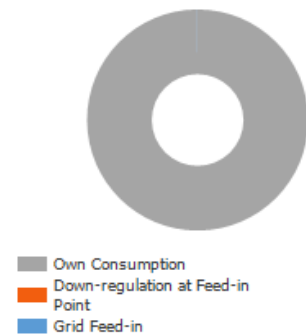
Simulation Results

Results Total System

PV System

PV Generator Output	141.16 kWp
Spec. Annual Yield	748.21 kWh/kWp
Performance Ratio (PR)	80.03 %
PV Generator Energy (AC grid)	105,636 kWh/Year
Own Consumption	105,564 kWh/Year
Down-regulation at Feed-in Point	0 kWh/Year
Grid Feed-in	72 kWh/Year
Own Power Consumption	99.9 %
CO ₂ Emissions avoided	49,638 kg / year

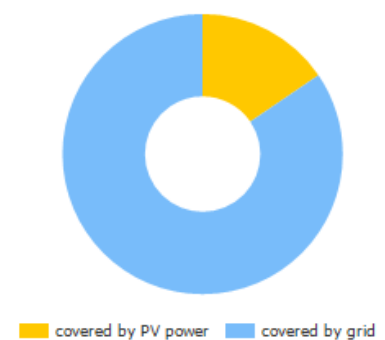
PV Generator Energy (AC grid)



Appliances

Appliances	681,742 kWh/Year
Standby Consumption (Inverter)	23 kWh/Year
Total Consumption	681,765 kWh/Year
covered by PV power	105,564 kWh/Year
covered by grid	576,201 kWh/Year
Solar Fraction	15.5 %

Total Consumption

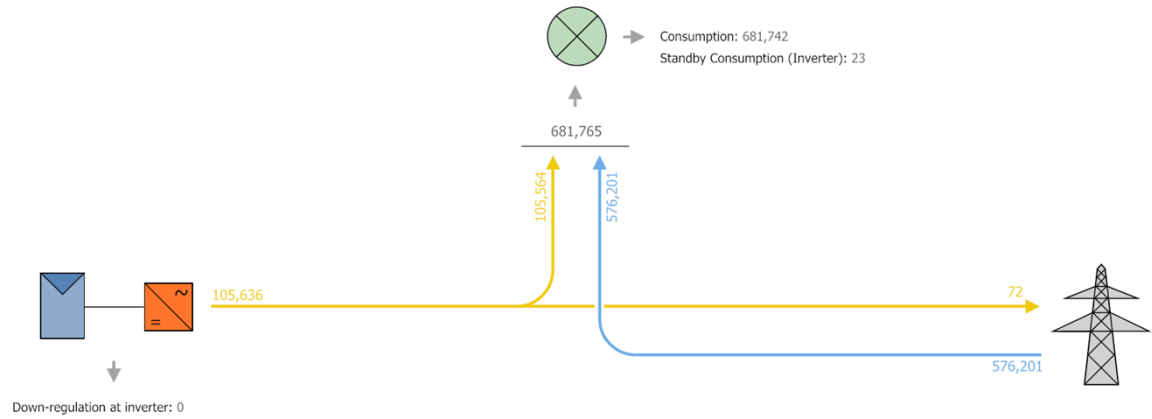


Level of Self-sufficiency

Total Consumption	681,765 kWh/Year
covered by grid	576,201 kWh/Year
Level of Self-sufficiency	15.5 %

Energy Flow Graph

Project: Xaverian College



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

Figure: Energy flow

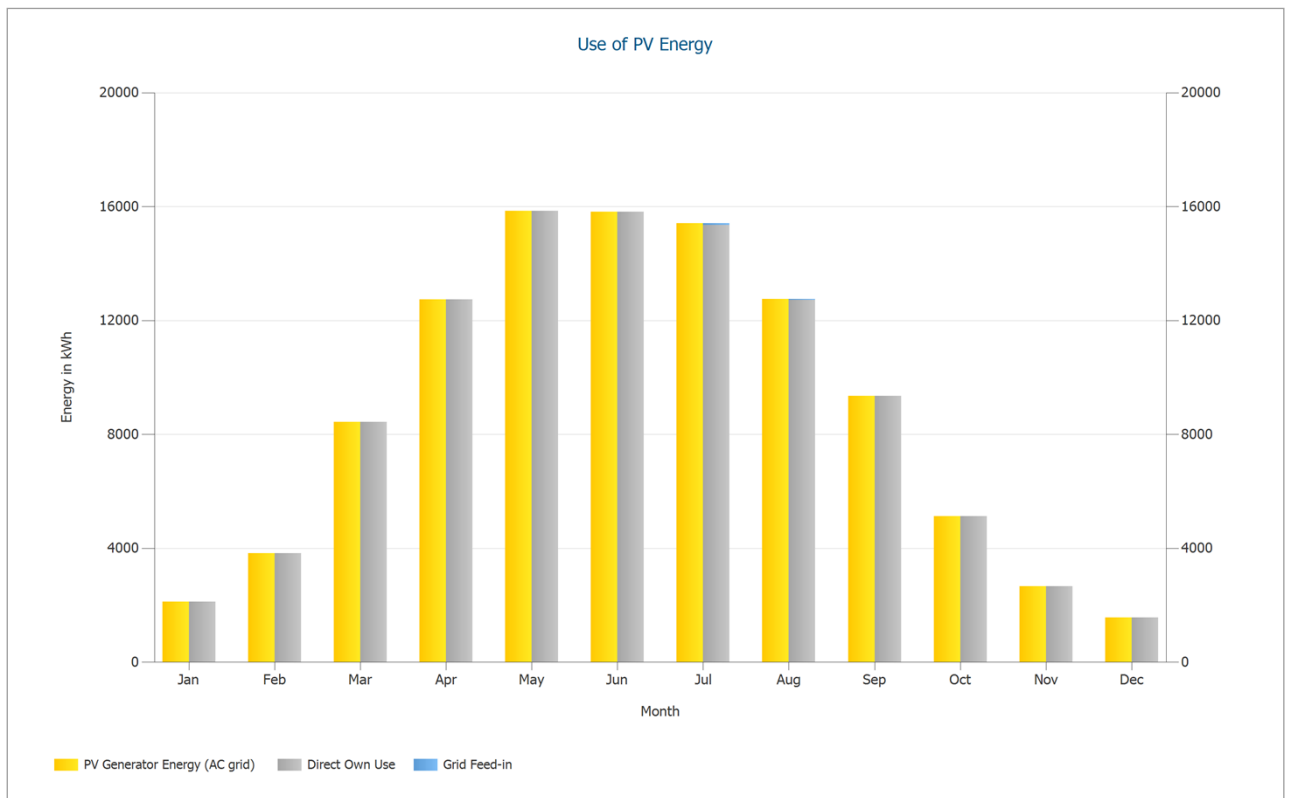


Figure: Use of PV Energy

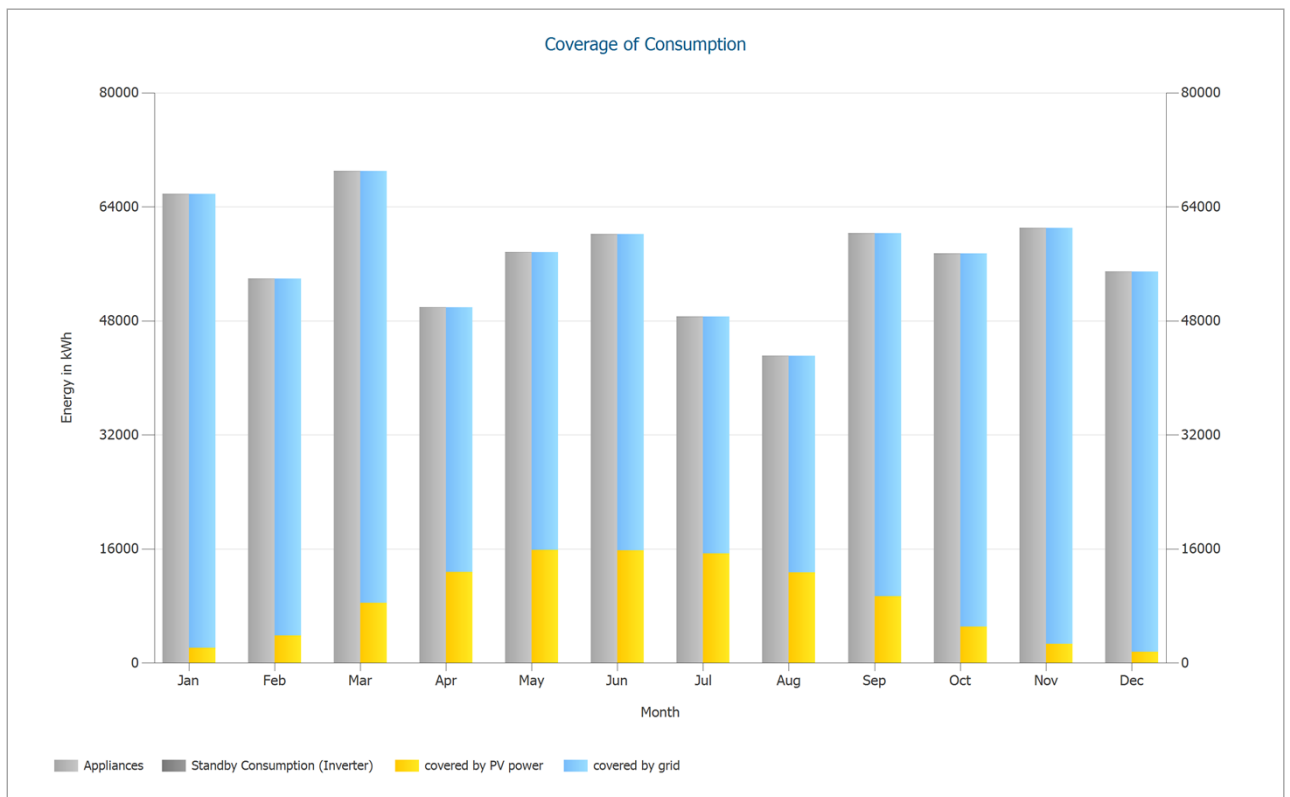


Figure: Coverage of Consumption

Financial Analysis

Overview

System Data

Grid Feed-in in the first year (incl. module degradation)	71 kWh/Year
PV Generator Output	141.2 kWp
Start of Operation of the System	06/04/2023
Assessment Period	20 Years
Interest on Capital	1 %

Economic Parameters

Internal Rate of Return (IRR)	21.41 %
Accrued Cash Flow (Cash Balance)	362,436.72 £
Amortization Period	4.9 Years
Electricity Production Costs	0.0814 £/kWh

Payment Overview

Specific Investment Costs	765.95 £/kWp
Investment Costs	108,117.00 £
One-off Payments	0.00 £
Incoming Subsidies	0.00 £
Annual Costs	2,162.34 £/Year
Other Revenue or Savings	0.00 £/Year

Remuneration and Savings

Total Payment from Utility in First Year	3.55 £/Year
First year savings	25,556.50 £/Year

X College 2 (Example)

Energy Price Tariff period 1	0.2503 £/kWh
Saving Tariff period 1	25,870.37 £/Year
Energy Price Tariff period 2	0.1893 £/kWh
Saving Tariff period 2	410.18 £/Year
Inflation Rate for Energy Price	3 %/Year

Remuneration of Electricity sold to Third Party

Price of Electricity sold to Third Party	0.05 £/kWh
Remuneration of Electricity sold to Third Party	3.55 £/Year

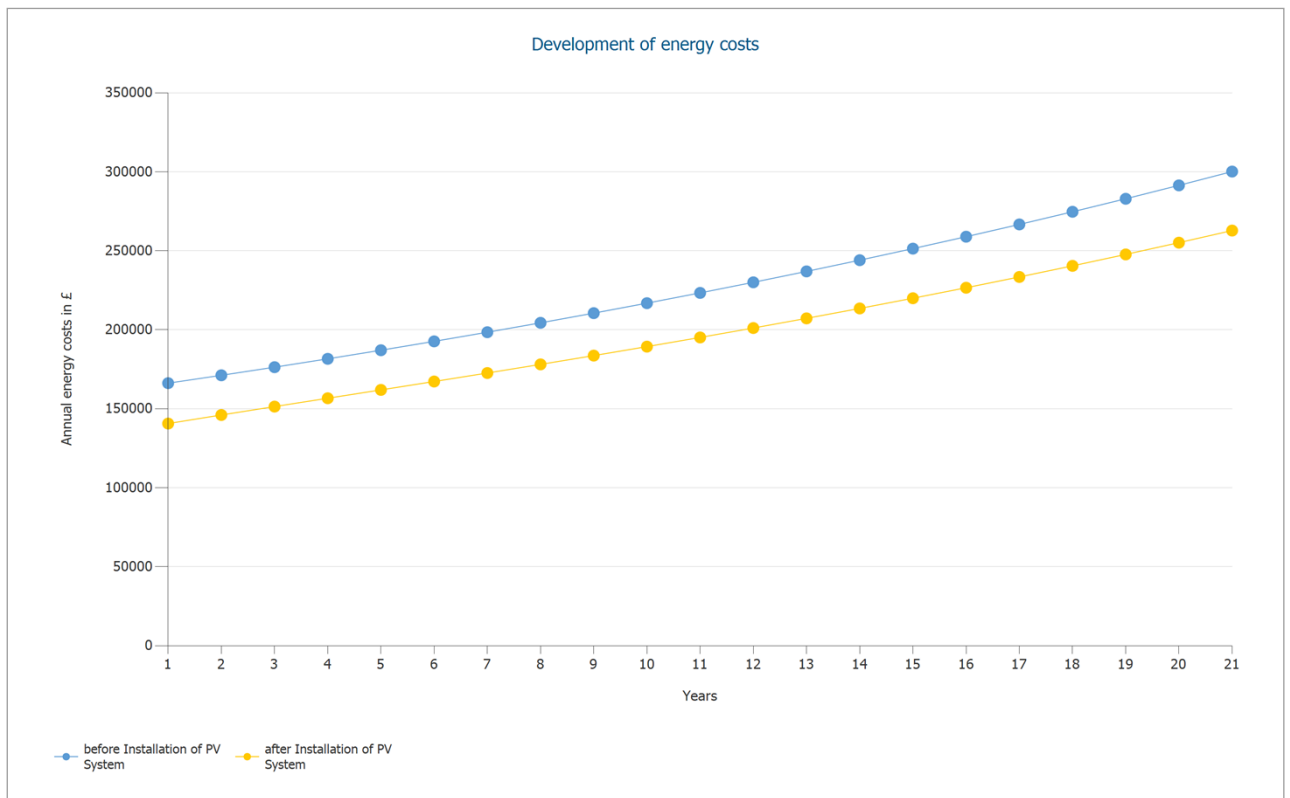


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
Investments	-£108,117.00	£0.00	£0.00	£0.00	£0.00
Operating costs	-£2,140.93	-£2,162.13	-£2,183.54	-£2,205.15	-£2,226.99
Feed-in / Export Tariff	£3.52	£3.32	£3.16	£3.04	£2.94
Electricity Savings	£25,216.33	£24,632.23	£24,207.78	£23,977.31	£23,899.76
Annual Cash Flow	-£85,038.08	£22,473.42	£22,027.41	£21,775.19	£21,675.71
Accrued Cash Flow (Cash Balance)	-£85,038.08	-£62,564.66	-£40,537.26	-£18,762.06	£2,913.65

Cash flow

	Year 6	Year 7	Year 8	Year 9	Year 10
Investments	£0.00	£0.00	£0.00	£0.00	£0.00
Operating costs	-£2,249.04	-£2,271.30	-£2,293.79	-£2,316.50	-£2,339.44
Feed-in / Export Tariff	£2.85	£2.79	£2.73	£2.68	£2.63
Electricity Savings	£23,943.21	£24,082.88	£24,299.52	£24,578.19	£24,907.30
Annual Cash Flow	£21,697.03	£21,814.36	£22,008.46	£22,264.36	£22,570.49
Accrued Cash Flow (Cash Balance)	£24,610.67	£46,425.03	£68,433.49	£90,697.85	£113,268.34

Cash flow

	Year 11	Year 12	Year 13	Year 14	Year 15
Investments	£0.00	£0.00	£0.00	£0.00	£0.00
Operating costs	-£2,362.60	-£2,385.99	-£2,409.62	-£2,433.48	-£2,457.57
Feed-in / Export Tariff	£2.59	£2.56	£2.53	£2.50	£2.47
Electricity Savings	£25,277.88	£25,683.03	£26,117.35	£26,576.76	£27,058.07
Annual Cash Flow	£22,917.88	£23,299.59	£23,710.26	£24,145.78	£24,602.97
Accrued Cash Flow (Cash Balance)	£136,186.22	£159,485.81	£183,196.07	£207,341.85	£231,944.82

Cash flow

	Year 16	Year 17	Year 18	Year 19	Year 20
Investments	£0.00	£0.00	£0.00	£0.00	£0.00
Operating costs	-£2,481.90	-£2,506.47	-£2,531.29	-£2,556.35	-£2,581.66
Feed-in / Export Tariff	£2.44	£2.41	£2.39	£2.36	£2.34
Electricity Savings	£27,558.88	£28,077.38	£28,612.19	£29,162.28	£29,726.93
Annual Cash Flow	£25,079.41	£25,573.31	£26,083.29	£26,608.29	£27,147.60
Accrued Cash Flow (Cash Balance)	£257,024.23	£282,597.55	£308,680.83	£335,289.12	£362,436.72

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

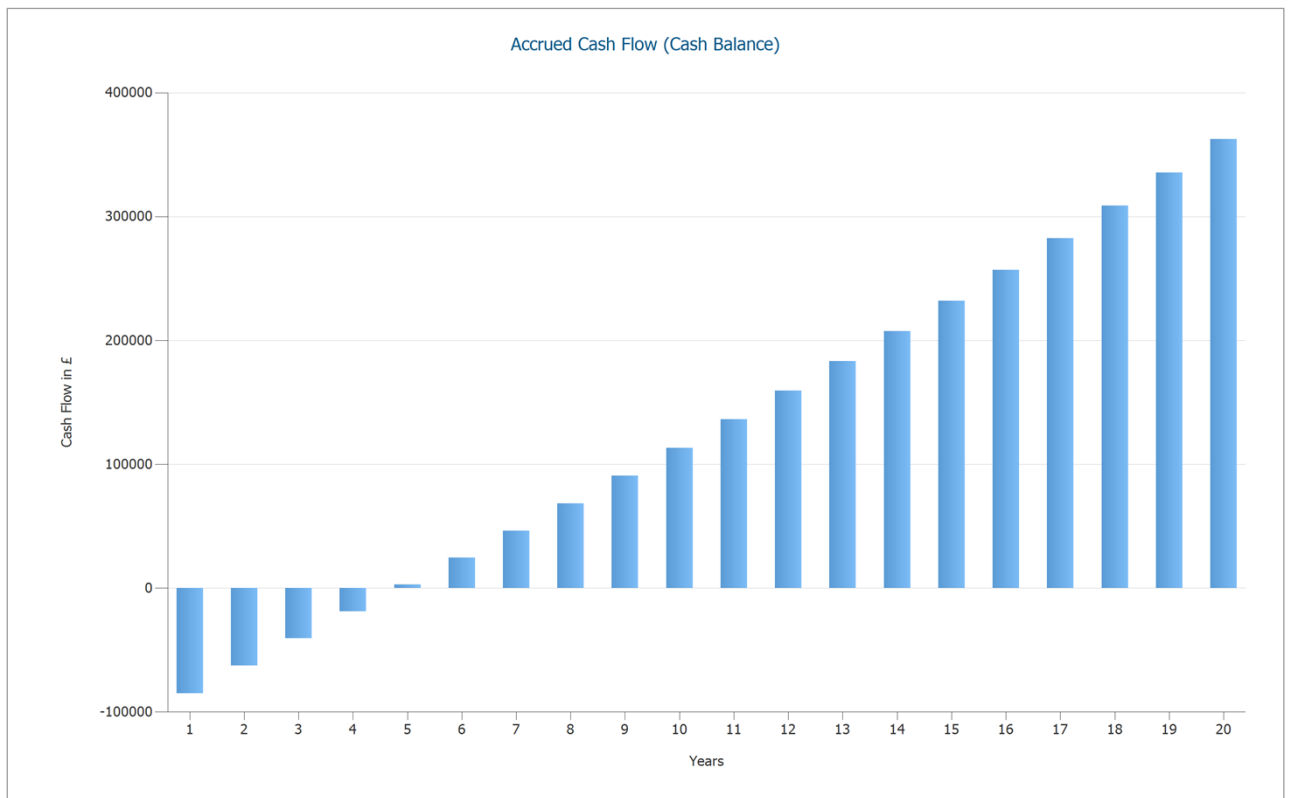


Figure: Accrued Cash Flow (Cash Balance)

Plans and parts list

Circuit Diagram

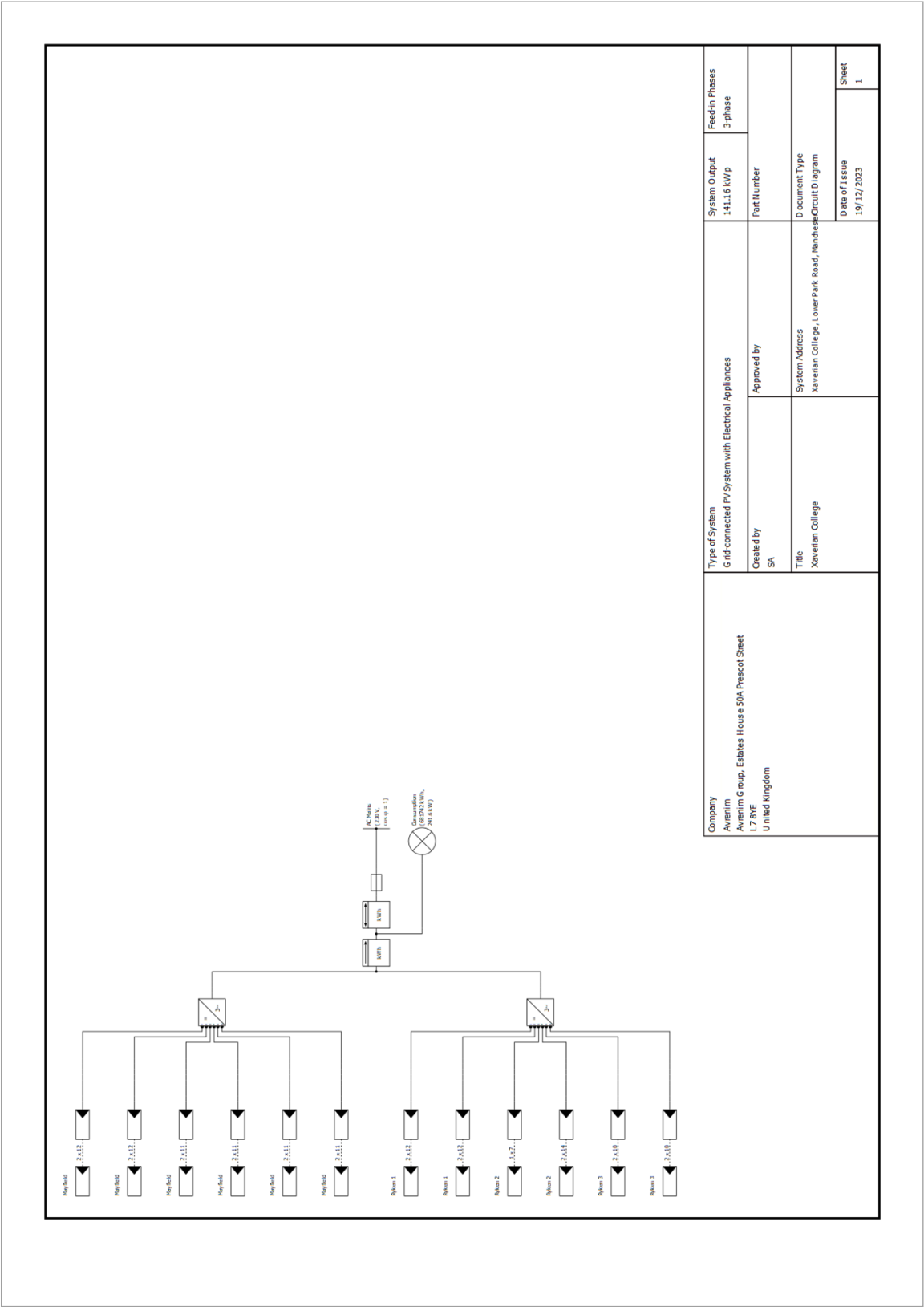


Figure: Circuit Diagram

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		Example	Nova 545mp144	259	Piece
2	Inverter		Ginlong (Solis)	Solis-80K-5G-PRO	1	Piece
3	Inverter		Ginlong (Solis)	S5-GC60K	1	Piece
4	Components			Feed-in Meter	1	Piece
5	Components			Bidirectional Meter	1	Piece
6	Components			Fuse	1	Piece