

Assura

New Street Surgery
21 New Street
Milnsbridge
Huddersfield
HD3 4LB

Project Name: Carbon Zero Energy PV installation

24/11/2023

Your PV system

Address of Installation

New Street Surgery
21 New Street
Milnsbridge
Huddersfield
HD3 4LB



Project Description:

Installation of grid connected solar PV system

Project Overview



Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances

Climate Data	Huddersfield, GBR (2001 - 2020)
Values source	Meteonorm 8.2(i)
PV Generator Output	25.8 kWp
PV Generator Surface	119.9 m ²
Number of PV Modules	60
Number of Inverters	4

Carbon Zero Energy PV installation

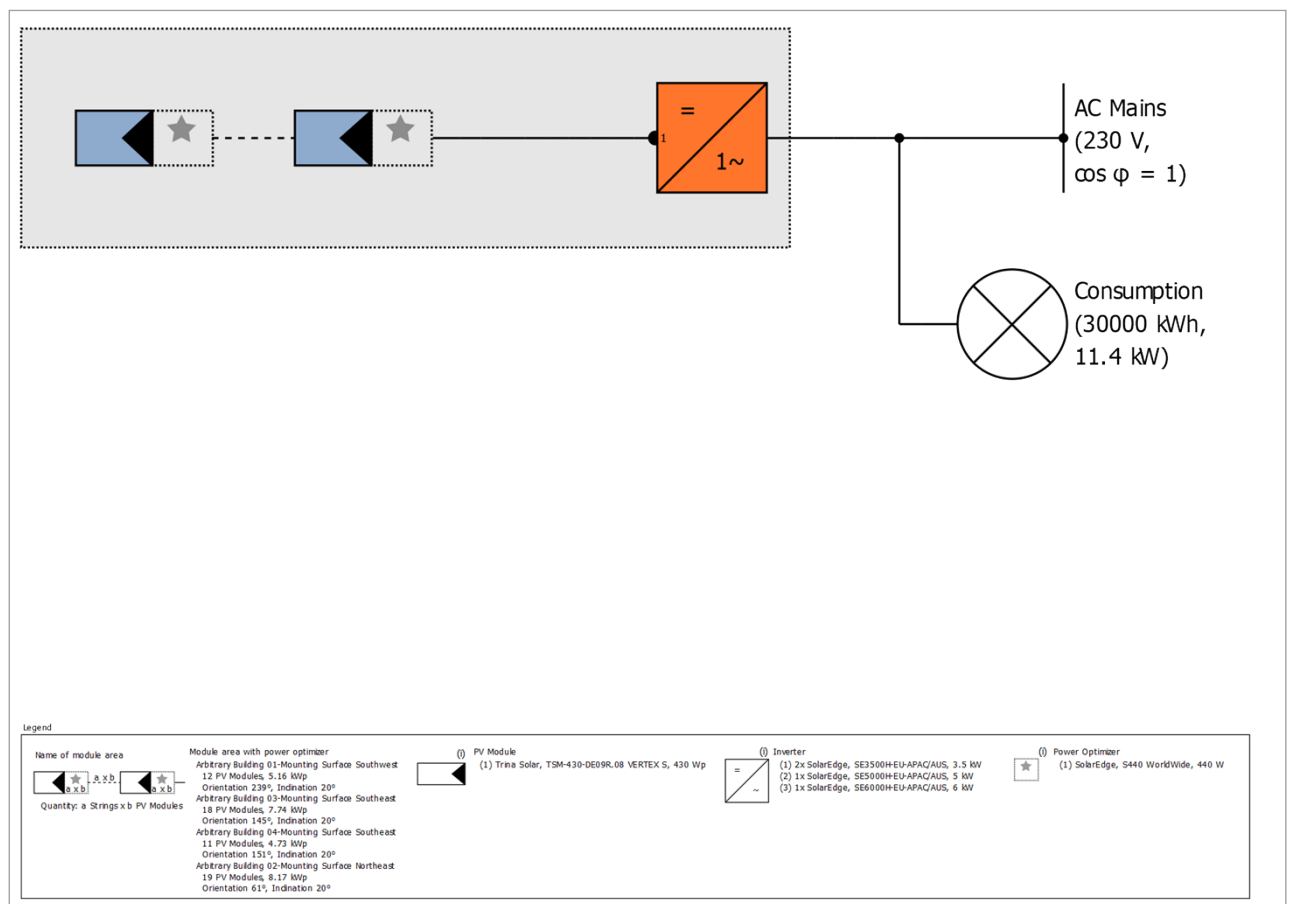


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	25.80 kWp
Spec. Annual Yield	955.47 kWh/kWp
Performance Ratio (PR)	93.98 %
Yield Reduction due to Shading	2.3 %
PV Generator Energy (AC grid)	24,694 kWh/Year
Own Consumption	13,995 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	10,491 kWh/Year
Own Power Consumption	57.4 %
CO ₂ Emissions avoided	4,758 kg / year
Level of Self-sufficiency	46.6 %

Financial Analysis

Your Gain

Total investment costs	30,960.00 £
Internal Rate of Return (IRR)	19.12 %
Amortization Period	5.9 Years
Electricity Production Costs	0.057 £/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	Huddersfield, GBR (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	30000 kWh
5 days Assura	30000 kWh
Load Peak	11.4 kW

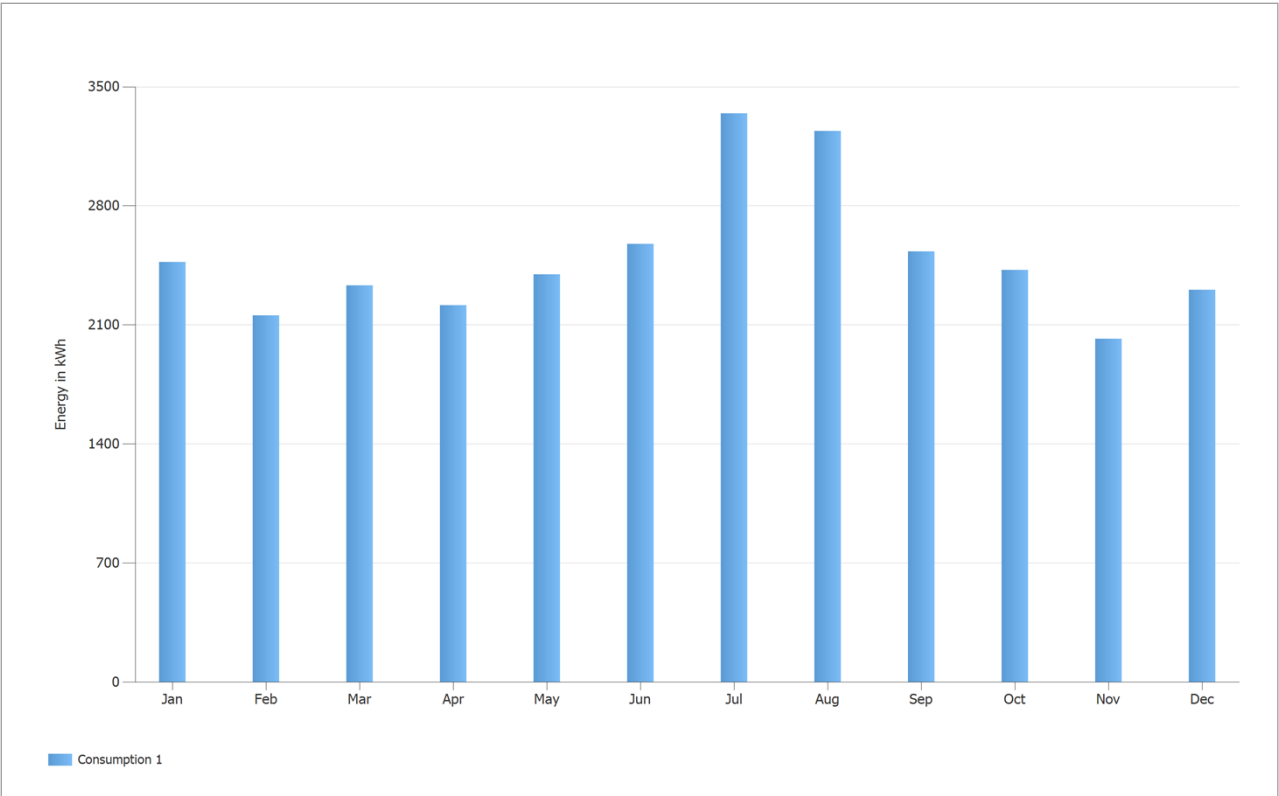


Figure: Consumption

Module Areas

1. Module Area - Arbitrary Building 01-Mounting Surface Southwest

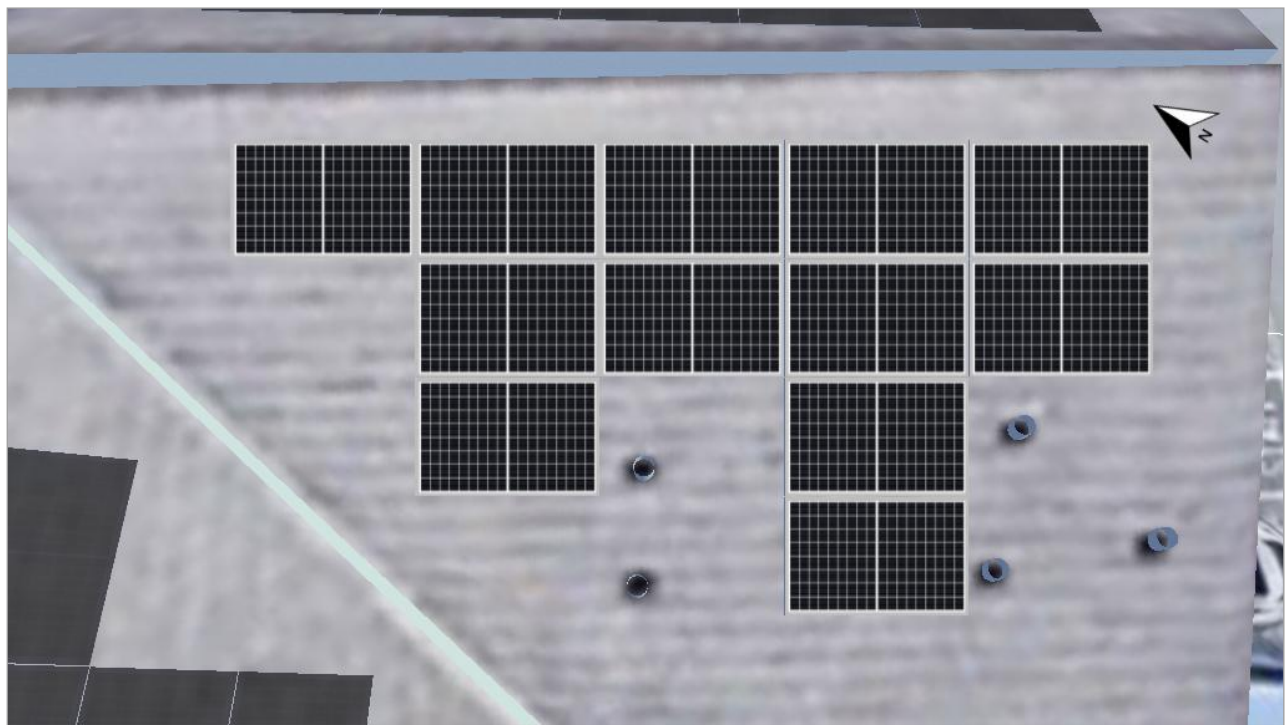


Figure: 1. Module Area - Arbitrary Building 01-Mounting Surface Southwest

Degradation of Module, 1. Module Area - Arbitrary Building 01-Mounting Surface Southwest		
Characteristic curve	Linear (straight line)	
Remaining power (power output) after 25 years		85 %

2. Module Area - Arbitrary Building 03-Mounting Surface Southeast

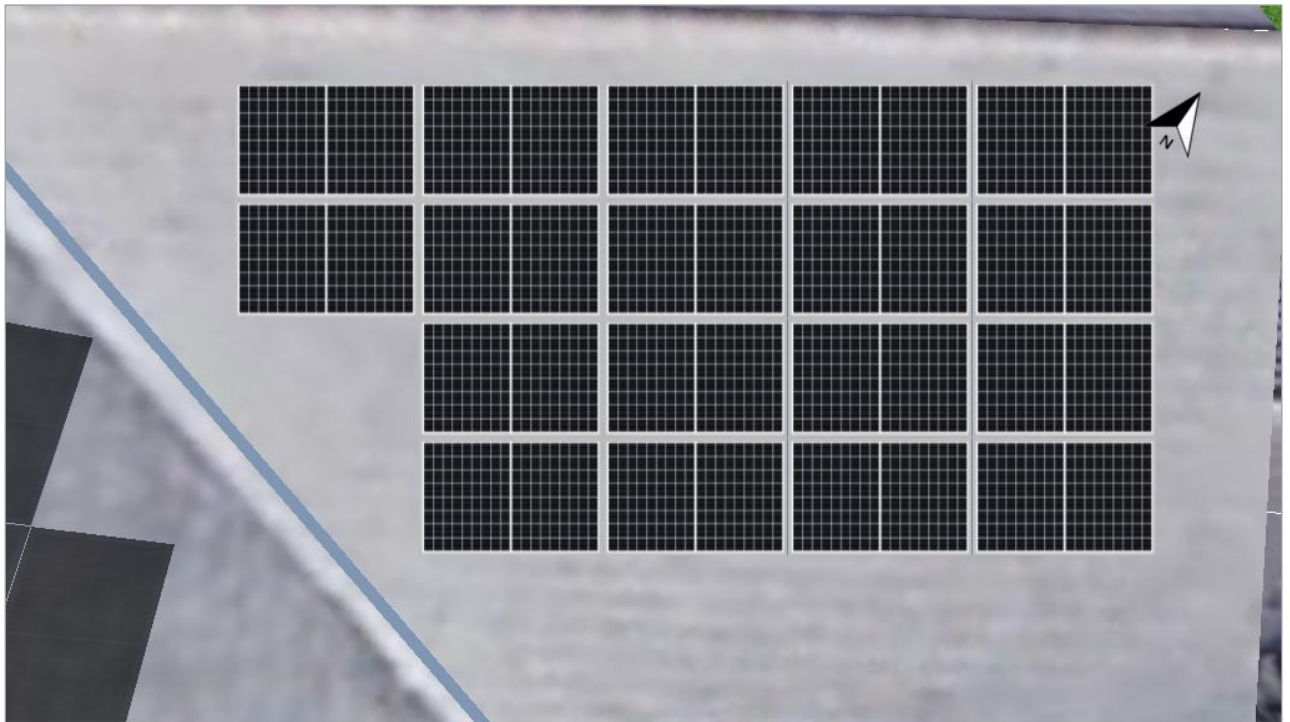


Figure: 2. Module Area - Arbitrary Building 03-Mounting Surface Southeast

Degradation of Module, 2. Module Area - Arbitrary Building 03-Mounting Surface Southeast

Characteristic curve	Linear (straight line)
Remaining power (power output) after 25 years	85 %

3. Module Area - Arbitrary Building 04-Mounting Surface Southeast

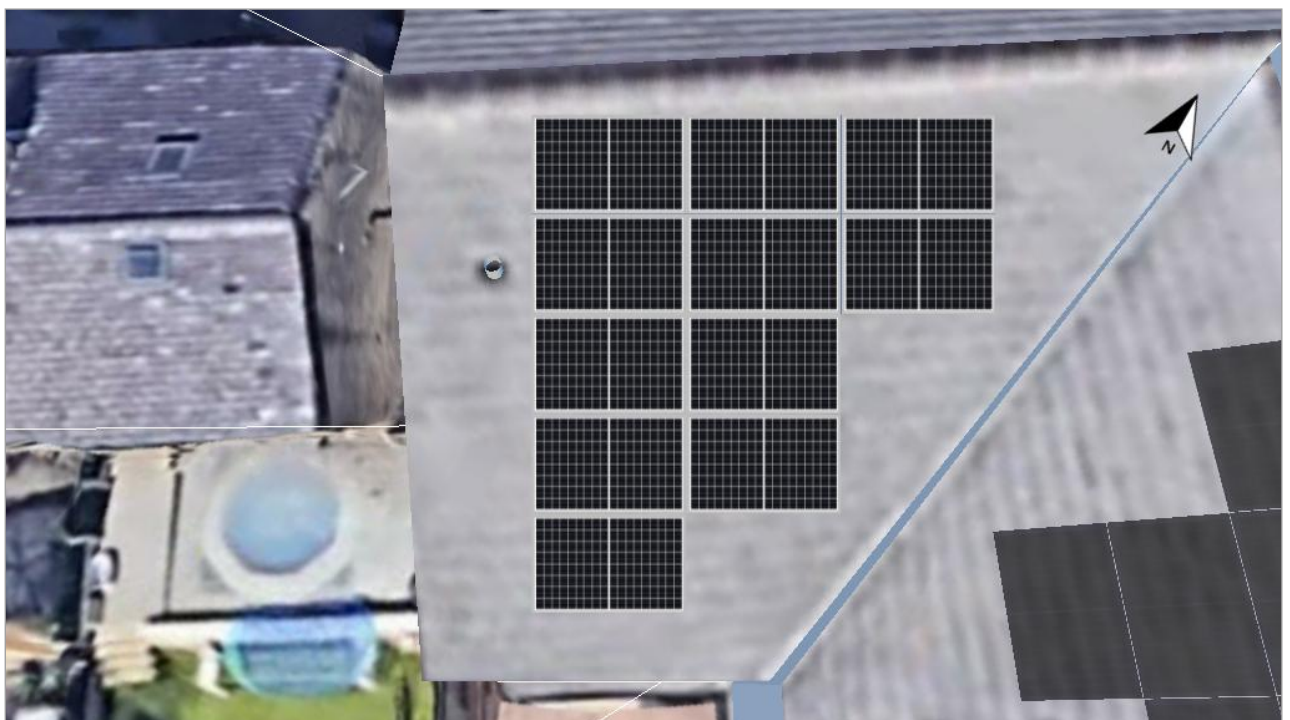


Figure: 3. Module Area - Arbitrary Building 04-Mounting Surface Southeast

Degradation of Module, 3. Module Area - Arbitrary Building 04-Mounting Surface Southeast

Characteristic curve	Linear (straight line)
Remaining power (power output) after 25 years	85 %

4. Module Area - Arbitrary Building 02-Mounting Surface Northeast



Figure: 4. Module Area - Arbitrary Building 02-Mounting Surface Northeast

Degradation of Module, 4. Module Area - Arbitrary Building 02-Mounting Surface Northeast

Characteristic curve	Linear (straight line)
Remaining power (power output) after 25 years	85 %

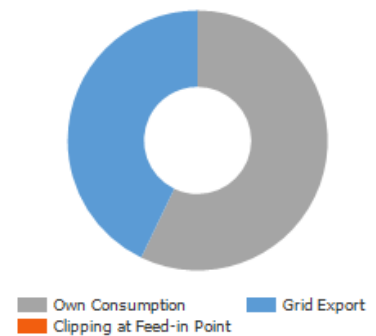
Simulation Results

Results Total System

PV System

PV Generator Output	25.80 kWp
Spec. Annual Yield	955.47 kWh/kWp
Performance Ratio (PR)	93.98 %
Yield Reduction due to Shading	2.3 %
PV Generator Energy (AC grid)	24,694 kWh/Year
Own Consumption	13,995 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	10,491 kWh/Year
Own Power Consumption	57.4 %
CO ₂ Emissions avoided	4,758 kg / year

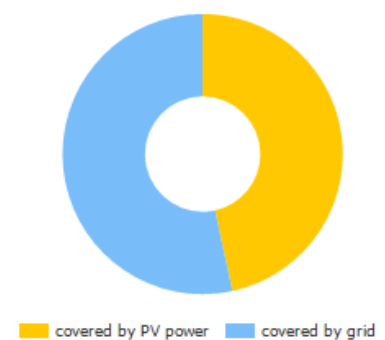
PV Generator Energy (AC grid)



Appliances

Appliances	30,000 kWh/Year
Standby Consumption (Inverter)	43 kWh/Year
Total Consumption	30,043 kWh/Year
covered by PV power	13,995 kWh/Year
covered by grid	16,048 kWh/Year
Solar Fraction	46.6 %

Total Consumption



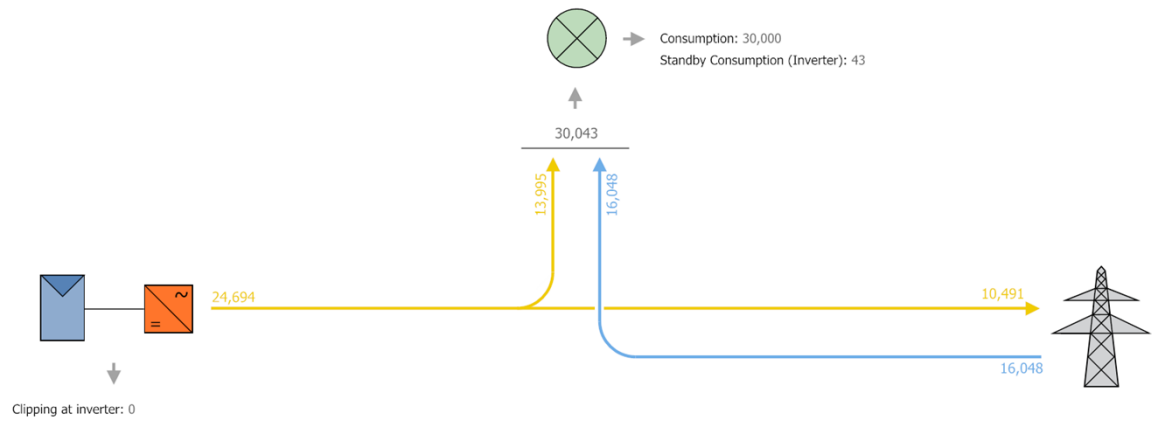
Level of Self-sufficiency

Total Consumption	30,043 kWh/Year
covered by grid	16,048 kWh/Year
Level of Self-sufficiency	46.6 %

Carbon Zero Energy PV installation

Energy Flow Graph

Project: Carbon Zero Energy PV installation



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

Figure: Energy flow

Carbon Zero Energy PV installation

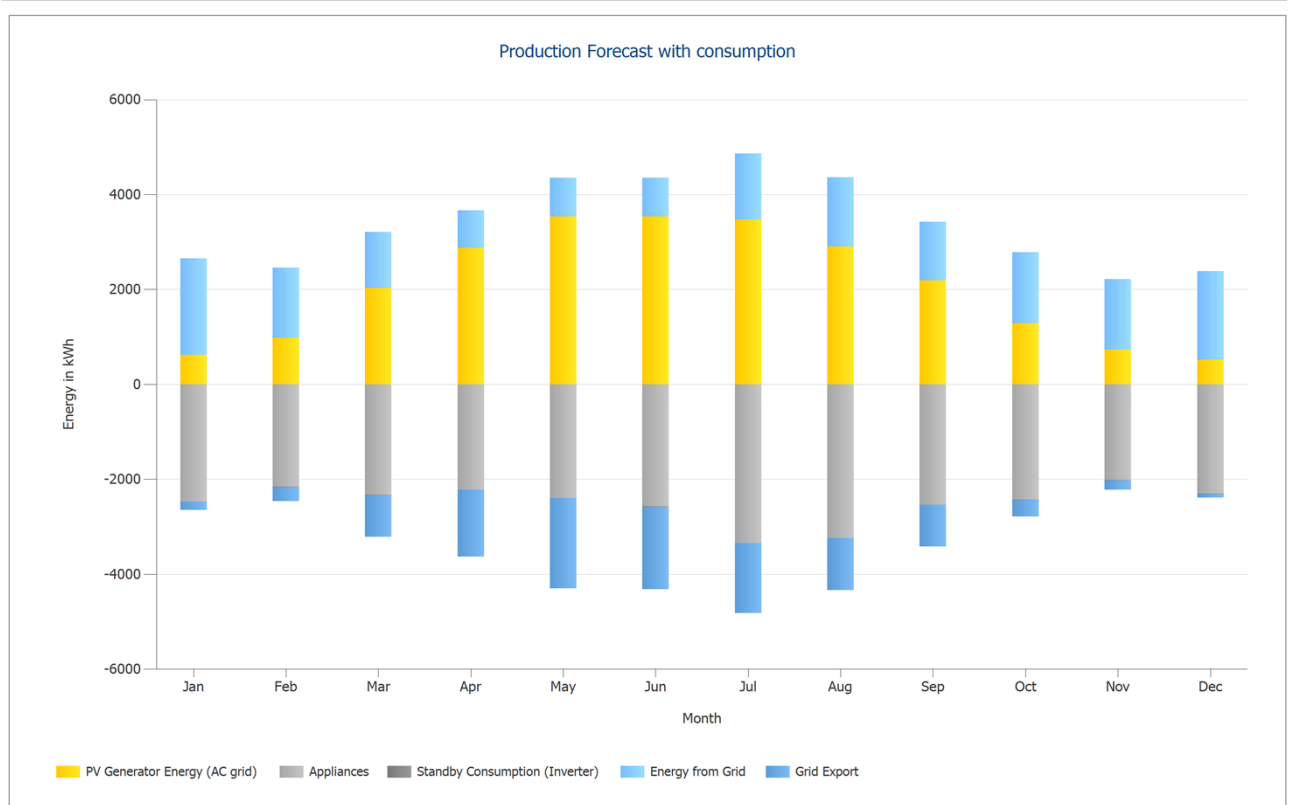


Figure: Production Forecast with consumption

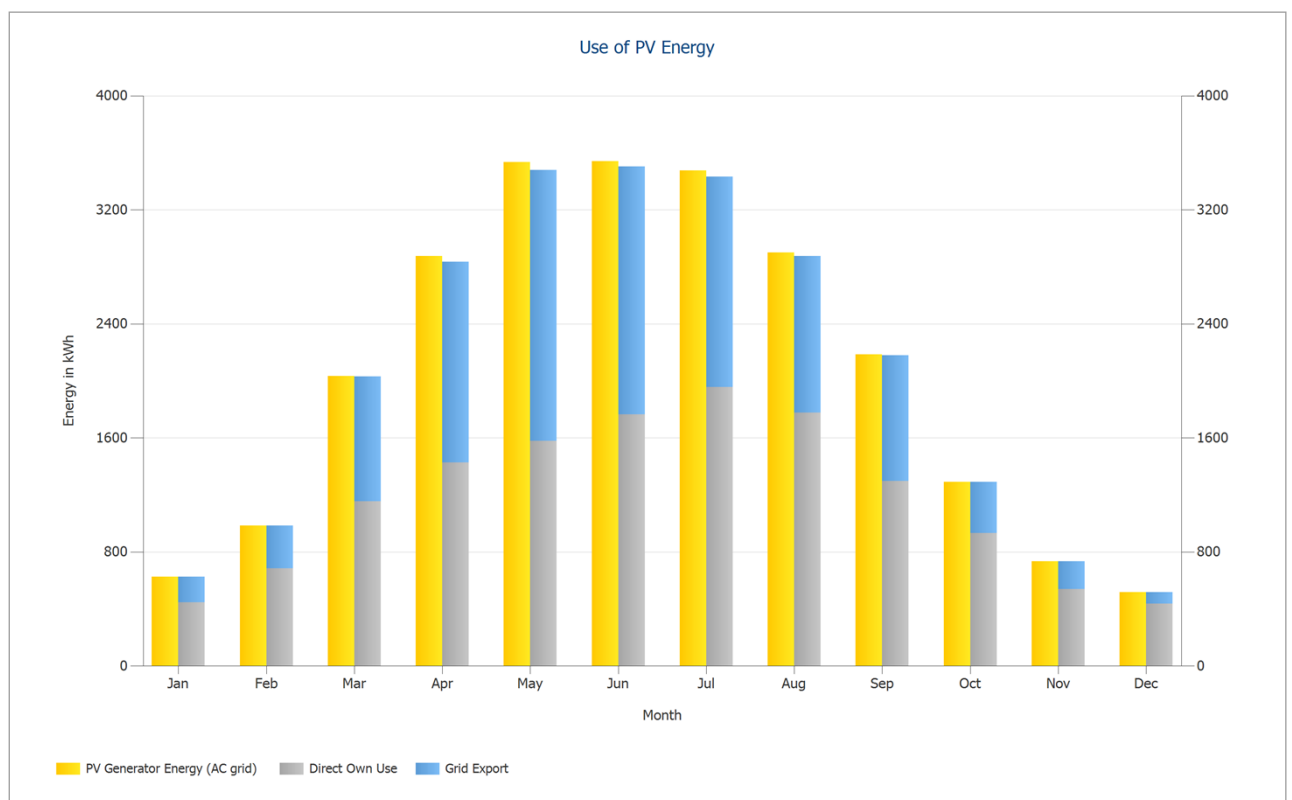


Figure: Use of PV Energy

Carbon Zero Energy PV installation

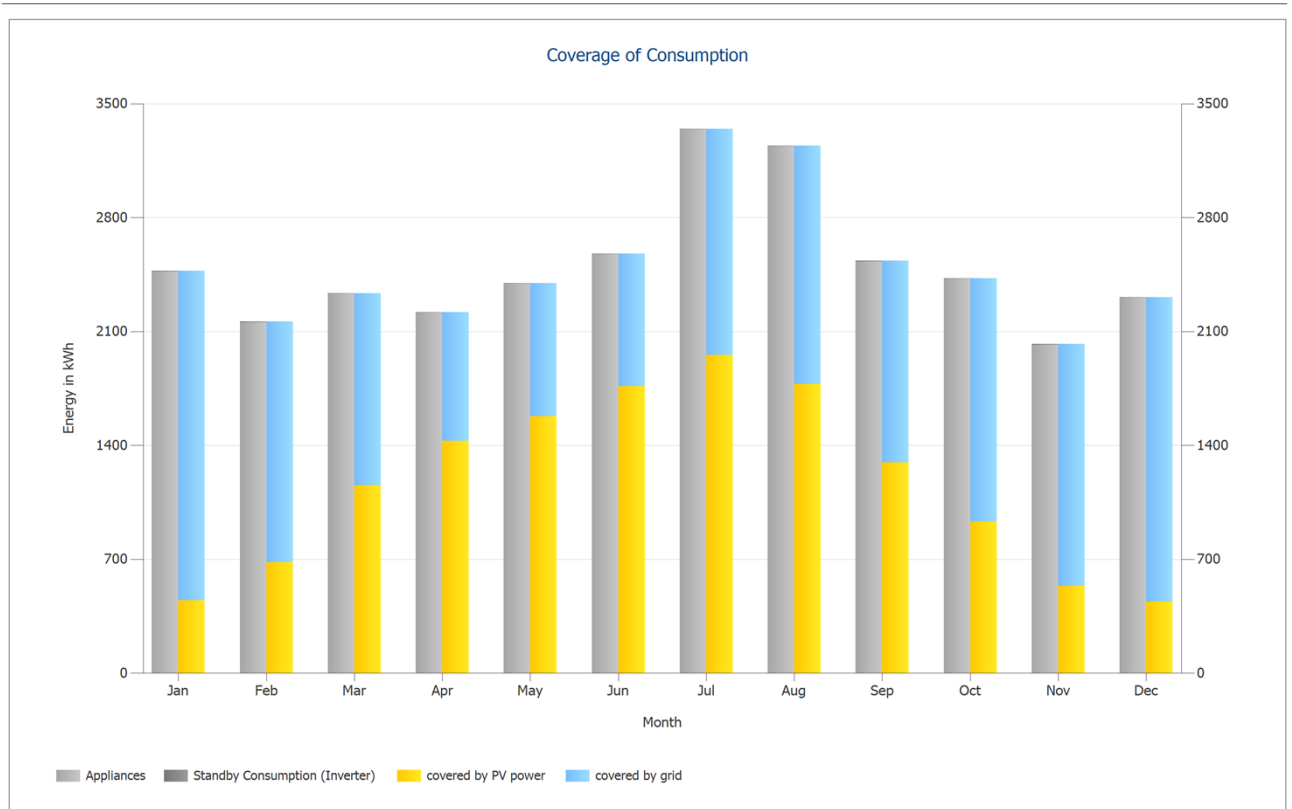


Figure: Coverage of Consumption

Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	10,467 kWh/Year
PV Generator Output	25.8 kWp
Start of Operation of the System	01/03/2024
Assessment Period	25 Years
Interest on Capital	1 %

Economic Parameters

Internal Rate of Return (IRR)	19.12 %
Accrued Cash Flow (Cash Balance)	141,843.96 £
Amortization Period	5.9 Years
Electricity Production Costs	0.057 £/kWh

Payment Overview

Specific Investment Costs	1,200.00 £/kWp
Investment Costs	30,960.00 £
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	785.06 £/Year
First year savings	4,172.12 £/Year

Assura 30p (Example)

Energy Price	0.3 £/kWh
Inflation Rate for Energy Price	5 %/Year

Remuneration of Electricity sold to Third Party

Price of Electricity sold to Third Party	0.08 £/kWh
Remuneration of Electricity sold to Third Party	785.06 £/Year

Carbon Zero Energy PV installation

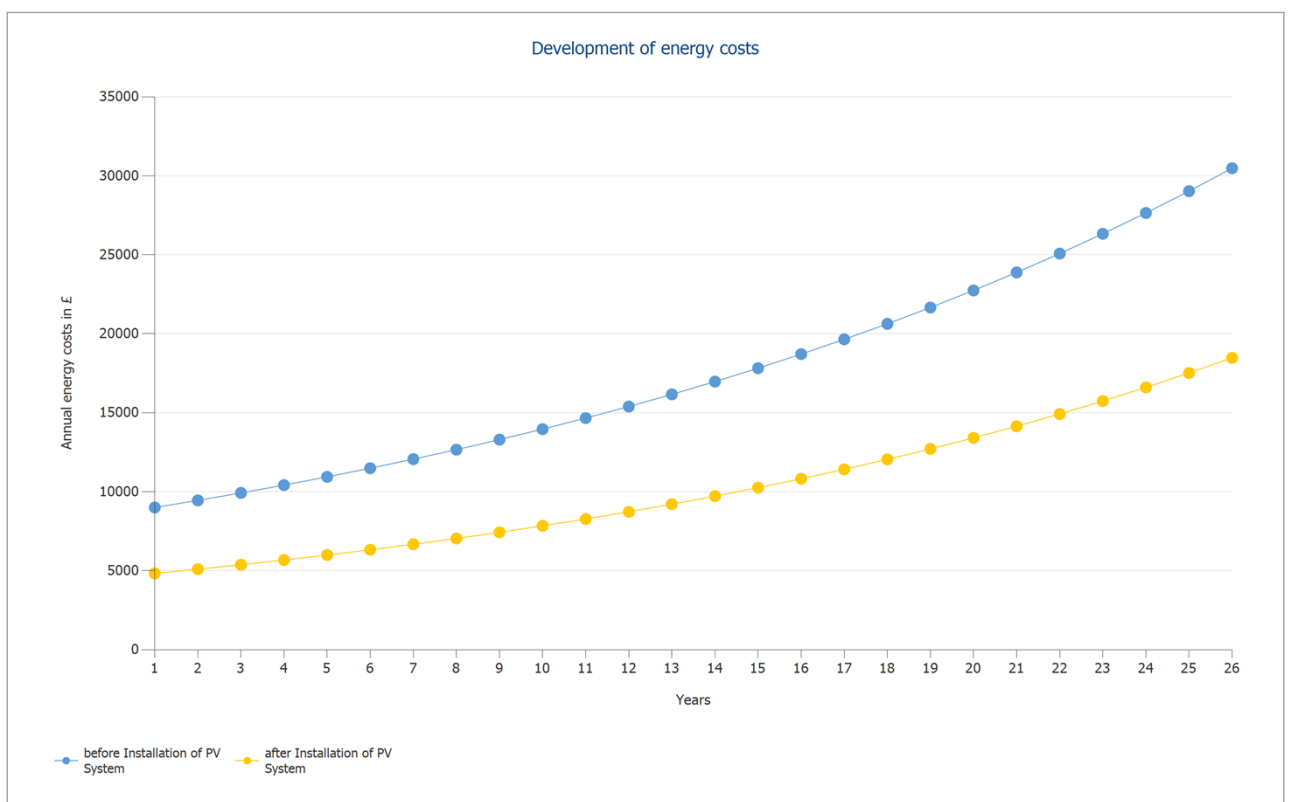


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
Investments	-£30,960.00	£0.00	£0.00	£0.00	£0.00
Feed-in / Export Tariff	£777.29	£764.96	£752.81	£740.82	£728.99
Electricity Savings	£4,130.81	£4,268.56	£4,410.74	£4,557.48	£4,708.93
Annual Cash Flow	-£26,051.90	£5,033.52	£5,163.54	£5,298.30	£5,437.92
Accrued Cash Flow (Cash Balance)	-£26,051.90	-£21,018.38	-£15,854.84	-£10,556.54	-£5,118.62

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	£717.33	£705.82	£694.47	£683.28	£672.24
Electricity Savings	£4,865.23	£5,026.52	£5,192.96	£5,364.70	£5,541.89
Annual Cash Flow	£5,582.56	£5,732.34	£5,887.43	£6,047.97	£6,214.13
Accrued Cash Flow (Cash Balance)	£463.93	£6,196.28	£12,083.71	£18,131.68	£24,345.81

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	£661.35	£650.61	£640.02	£629.58	£619.28
Electricity Savings	£5,724.71	£5,913.31	£6,107.87	£6,308.57	£6,515.59
Annual Cash Flow	£6,386.06	£6,563.92	£6,747.90	£6,938.15	£7,134.87
Accrued Cash Flow (Cash Balance)	£30,731.87	£37,295.80	£44,043.69	£50,981.85	£58,116.72

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	£609.12	£599.11	£589.23	£579.49	£569.88
Electricity Savings	£6,729.11	£6,949.32	£7,176.42	£7,410.61	£7,652.09
Annual Cash Flow	£7,338.23	£7,548.43	£7,765.65	£7,990.09	£8,221.97
Accrued Cash Flow (Cash Balance)	£65,454.95	£73,003.38	£80,769.02	£88,759.11	£96,981.08

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	£560.41	£551.06	£541.85	£532.77	£523.81
Electricity Savings	£7,901.08	£8,157.78	£8,422.43	£8,695.24	£8,976.45
Annual Cash Flow	£8,461.48	£8,708.85	£8,964.28	£9,228.01	£9,500.26
Accrued Cash Flow (Cash Balance)	£105,442.56	£114,151.41	£123,115.69	£132,343.70	£141,843.96

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

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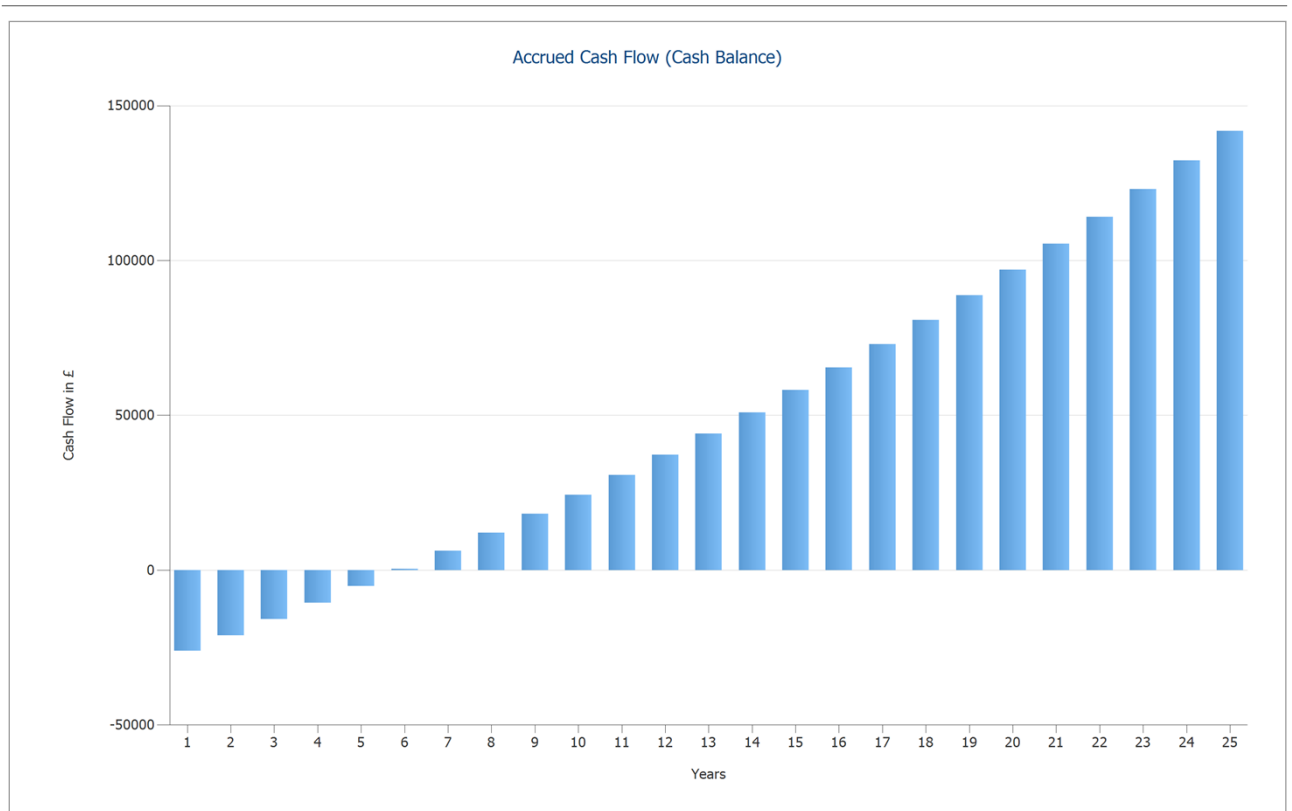


Figure: Accrued Cash Flow (Cash Balance)