



REF Electrics (Taunton) Ltd
22 Acorn Business Centre
Livingstone Way
United Kingdom

Customer No.: 19213
Project Name: Lyme Regis Mini Golf Hut
Offer no.: 19213

14/06/2024

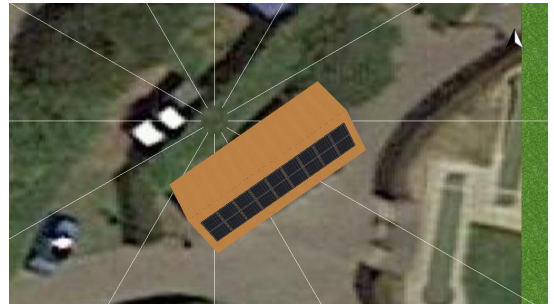
Documentation- 19213

Customer Details

Company	Wrencon
Customer Number	19213
Contact person	Lee Cox
Address	Unit 1 Allerford Farm Barns, Taunton TA4 1AL
Phone	
Fax	
E-Mail	

Project Data

Project Name	Lyme Regis Mini Golf Hut
Offer no.	19213
Project Designer	Matthew Perry
Address	Guildhall Cottage, Church Street Lyme Regis Dorset DT7 3BS



Project Description:
Solar PV to new Mini Golf Hut



Lyme Regis Mini Golf Hut

Project Designer: Matthew Perry
Offer Number: 19213

Client: Wrencon , Lee Cox
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Project Overview

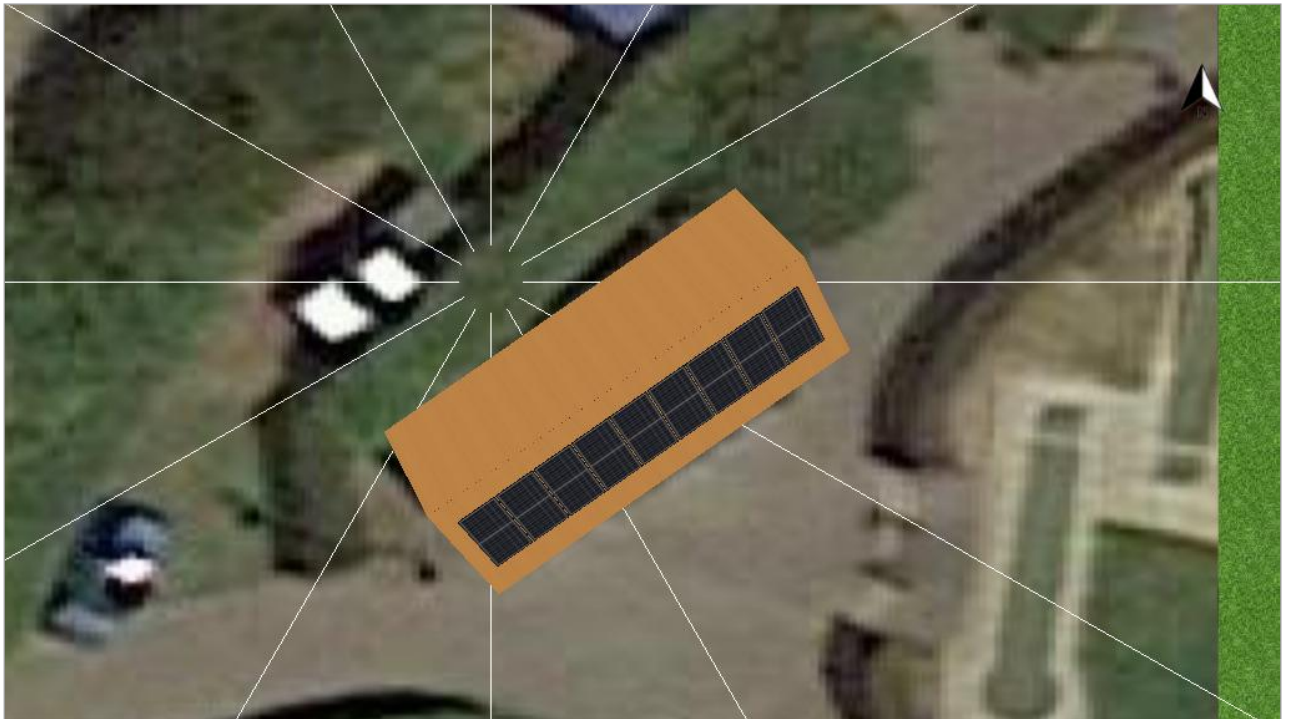


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances

Climate Data	Lyme Regis, GBR (2001 - 2020)
Values source	Meteonorm 8.2(i)
PV Generator Output	3.65 kWp
PV Generator Surface	17.6 m ²
Number of PV Modules	9
Number of Inverters	1

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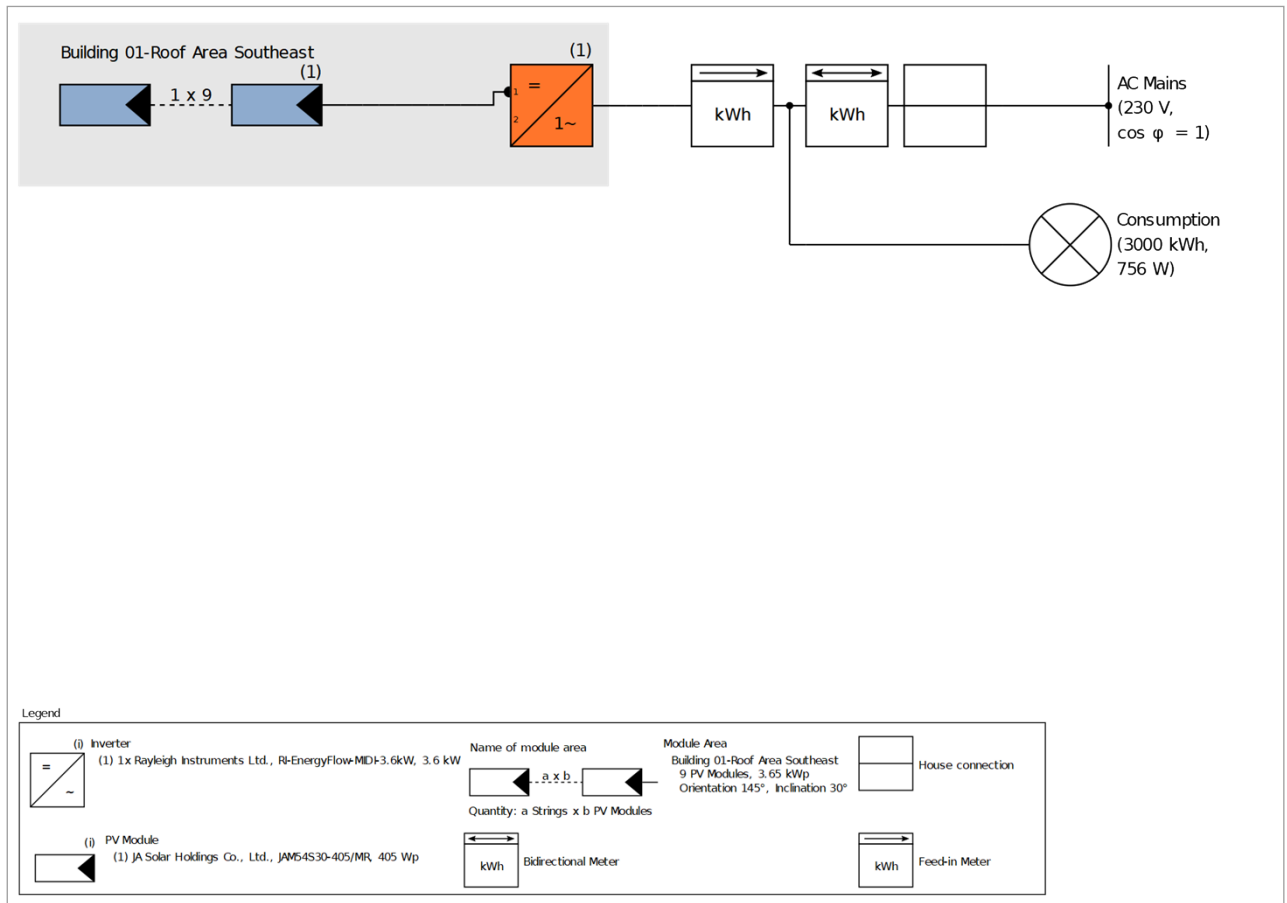


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	3.65 kWp
Spec. Annual Yield	1,025.56 kWh/kWp
Performance Ratio (PR)	81.80 %
Yield Reduction due to Shading	0.0 %
PV Generator Energy (AC grid)	3,738 kWh/Year
Own Consumption	1,191 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	2,547 kWh/Year
Own Power Consumption	31.9 %
CO ₂ Emissions avoided	1,757 kg / year
Level of Self-sufficiency	39.7 %

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.

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Set-up of the System

Overview

System Data

Type of System 3D, Grid-connected PV System with Electrical Appliances

Climate Data

Location Lyme Regis, GBR (2001 - 2020)

Values source Meteonorm 8.2(i)

Resolution of the data 1 min

Simulation models used:

- Diffuse Irradiation onto Horizontal Plane Hofmann
- Irradiance onto tilted surface Hay & Davies

Consumption

Total Consumption 3000 kWh

BDEW load profile business (G2) 3000 kWh

Load Peak 0.8 kW

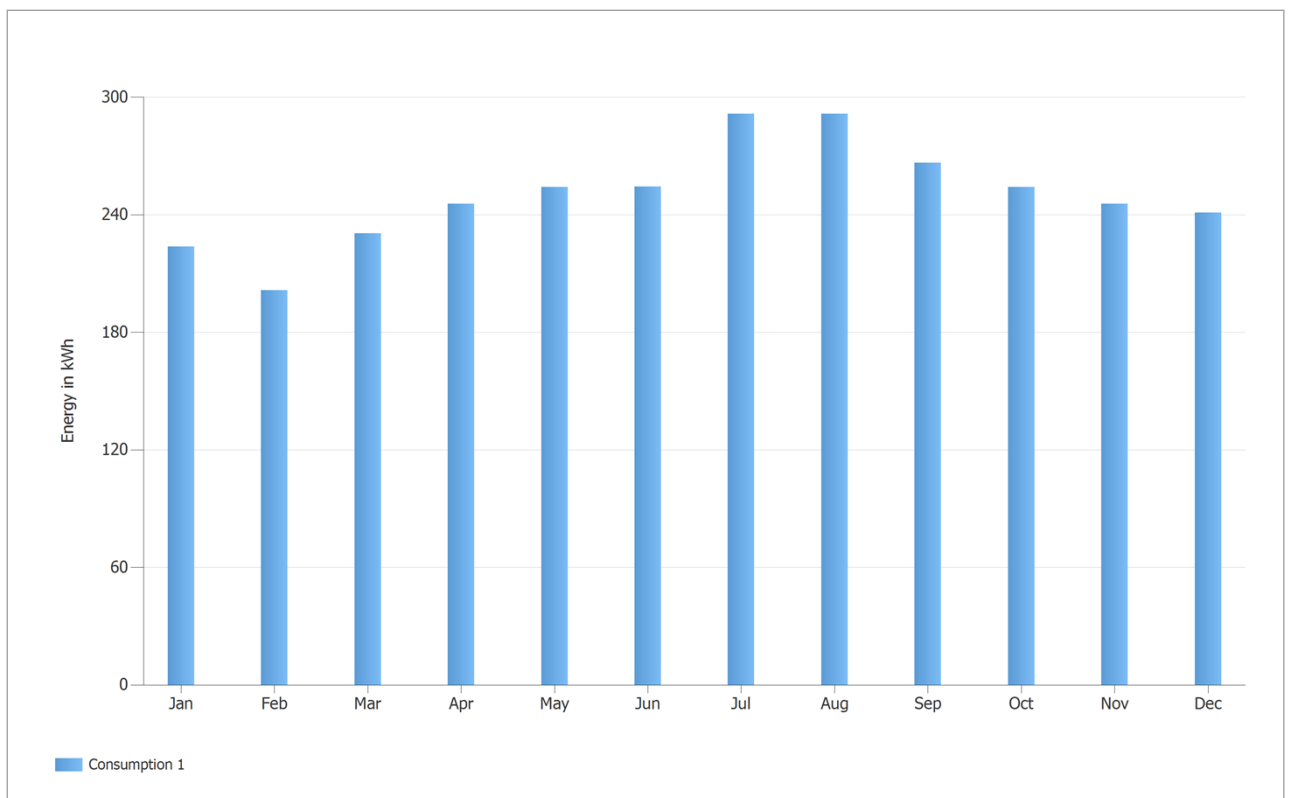


Figure: Consumption

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Module Areas

1. Module Area - Building 01-Roof Area Southeast

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

Name	Building 01-Roof Area Southeast
PV Modules	9 x JAM54S30-405/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	30 °
Orientation	Southeast 145 °
Installation Type	Roof parallel
PV Generator Surface	17.6 m ²

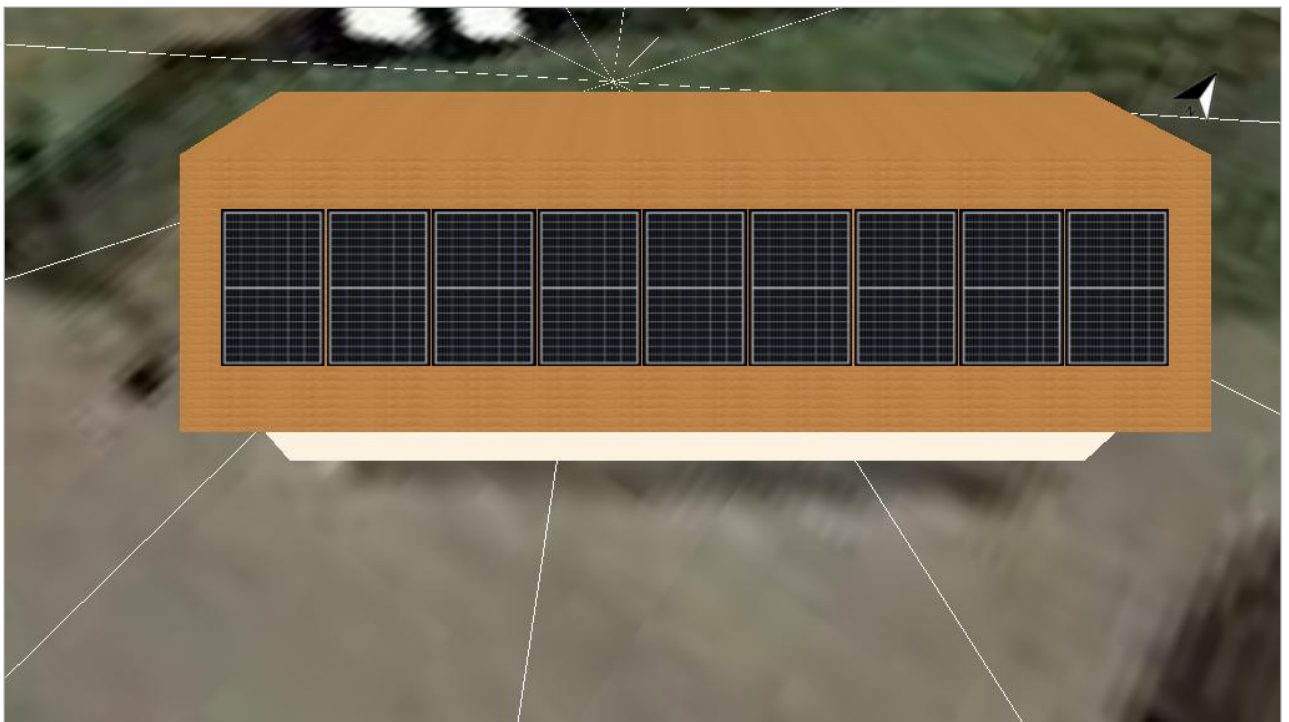


Figure: 1. Module Area - Building 01-Roof Area Southeast

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Degradation of Module, 1. Module Area - Building 01-Roof Area Southeast

Characteristic curve	Exponential
Remaining power (power output) after 1 year	95 %
Remaining power (power output) after 10 years	80 %

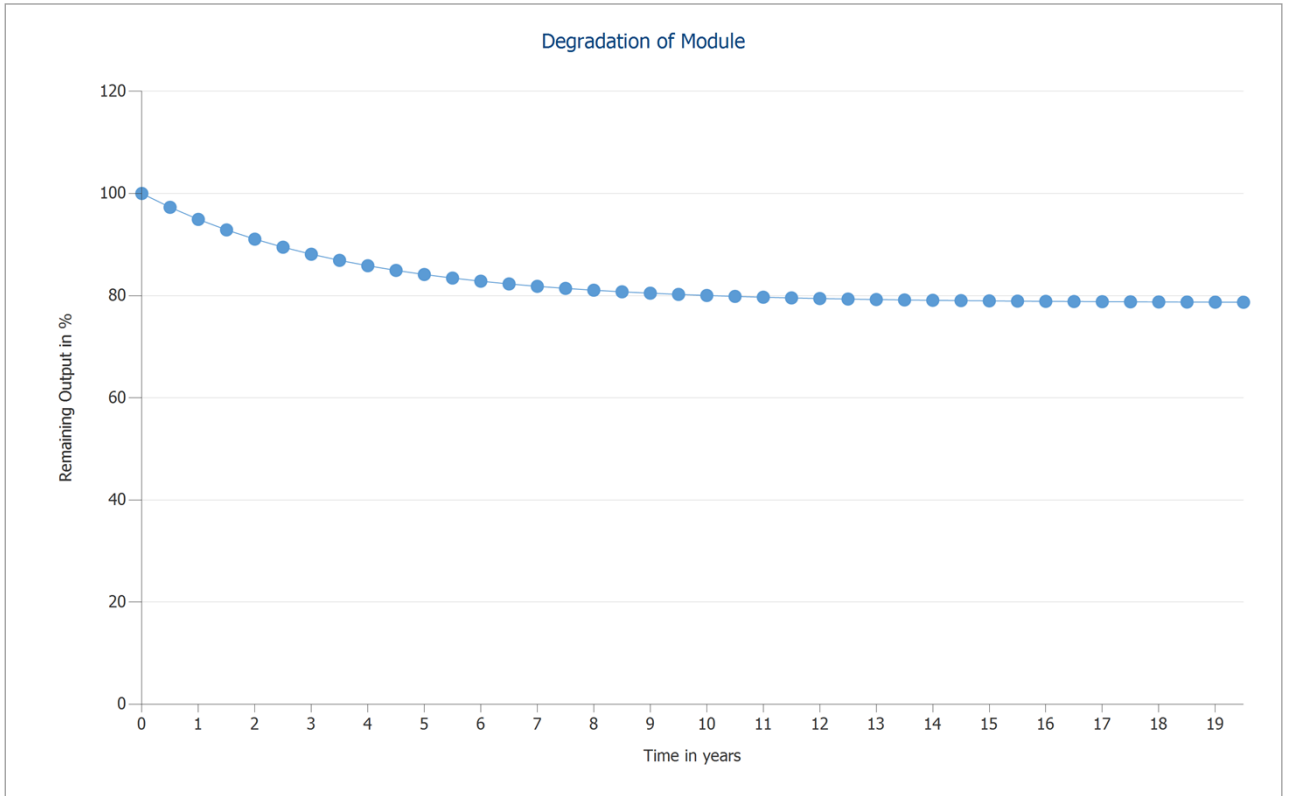


Figure: Degradation of Module, 1. Module Area - Building 01-Roof Area Southeast

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Horizon Line, 3D Design

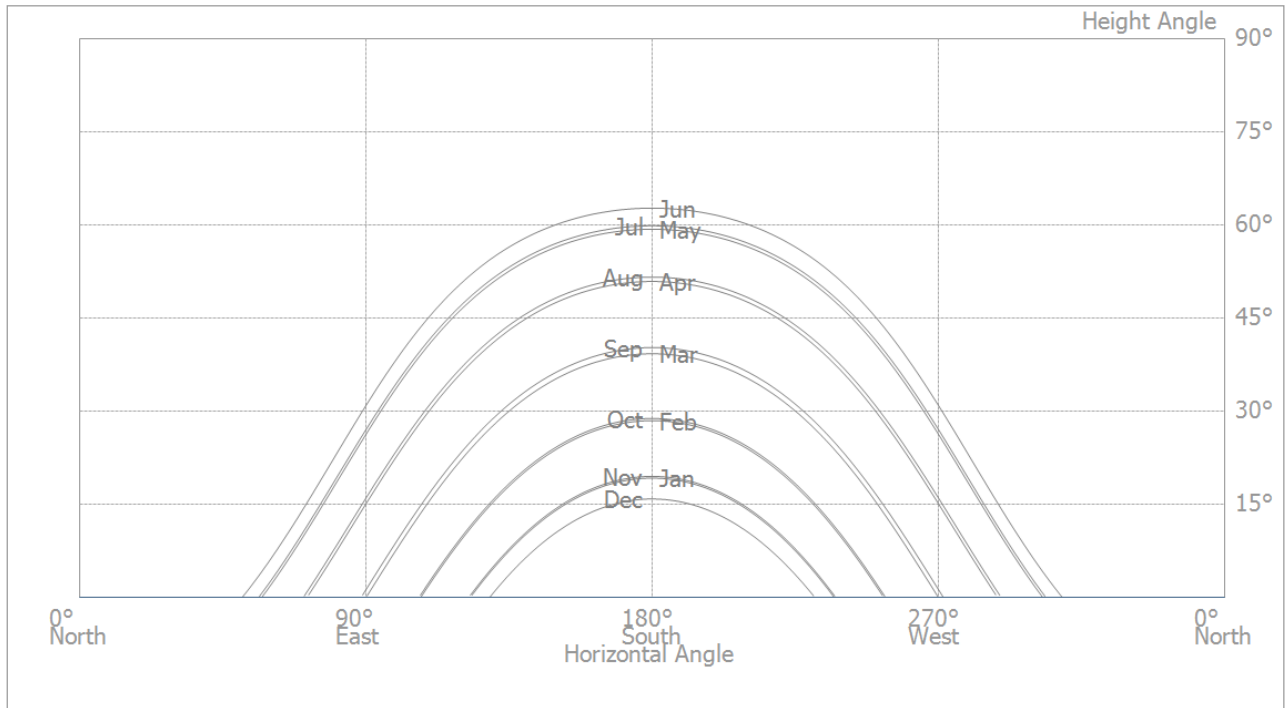


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Area	Building 01-Roof Area Southeast
Inverter 1	
Model	RI-EnergyFlow-MIDI-3.6kW (v1)
Manufacturer	Rayleigh Instruments Ltd.
Quantity	1
Sizing Factor	101.3 %
Configuration	MPP 1: 1 x 9 MPP 2: not allocated

AC Mains

AC Mains

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

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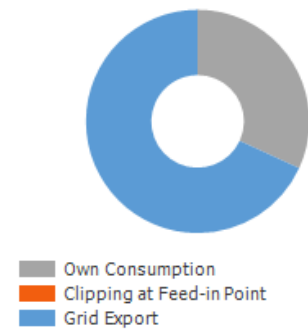
Simulation Results

Results Total System

PV System

PV Generator Output	3.65 kWp
Spec. Annual Yield	1,025.56 kWh/kWp
Performance Ratio (PR)	81.80 %
Yield Reduction due to Shading	0.0 %
PV Generator Energy (AC grid)	3,738 kWh/Year
Own Consumption	1,191 kWh/Year
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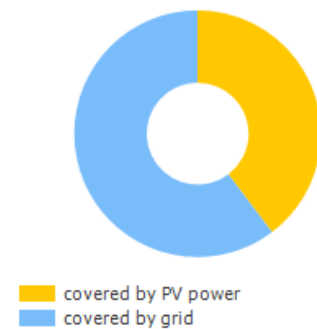
PV Generator Energy (AC grid)



Appliances

Appliances	3,000 kWh/Year
Standby Consumption (Inverter)	0 kWh/Year
Total Consumption	3,000 kWh/Year
covered by PV power	1,191 kWh/Year
covered by grid	1,809 kWh/Year
Solar Fraction	39.7 %

Total Consumption



Level of Self-sufficiency

Total Consumption	3,000 kWh/Year
covered by grid	1,809 kWh/Year
Level of Self-sufficiency	39.7 %

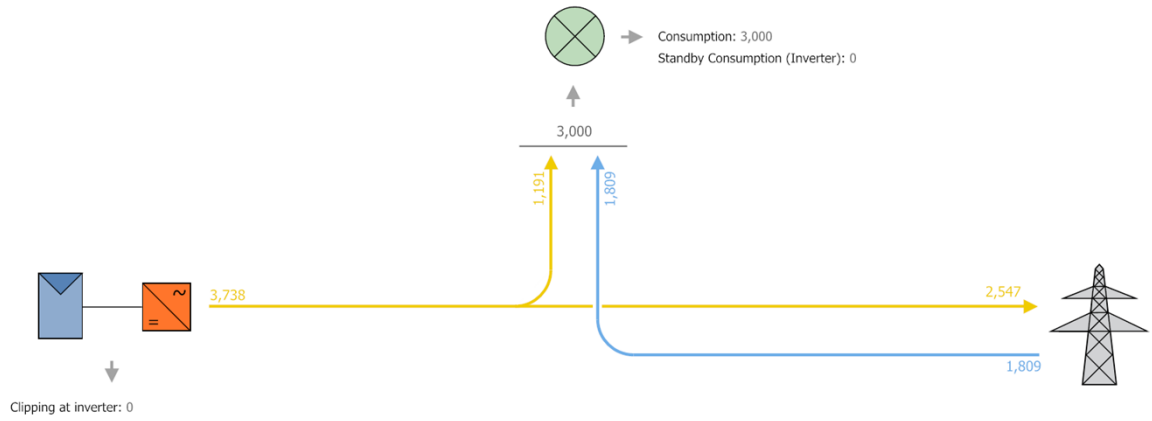
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Energy Flow Graph

Project: Lyme Regis Mini Golf Hut



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

Figure: Energy flow

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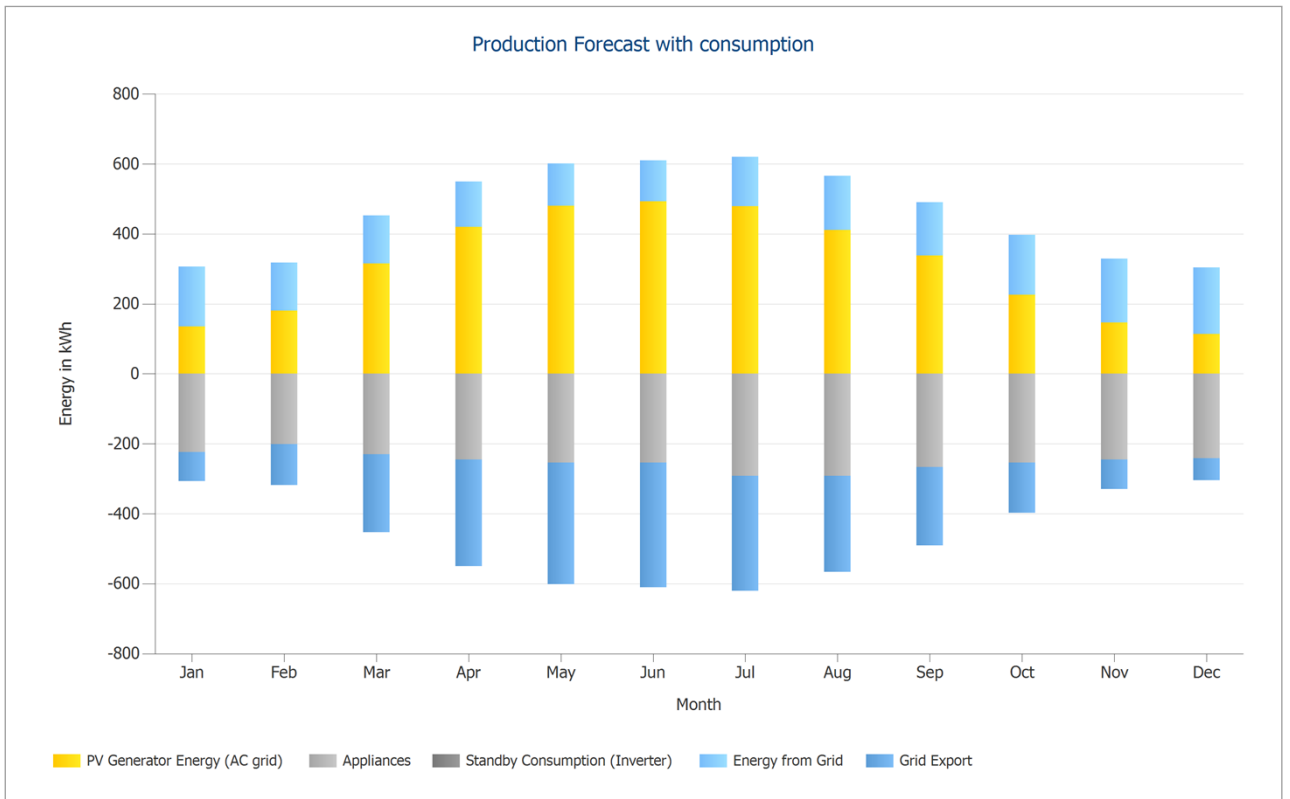


Figure: Production Forecast with consumption

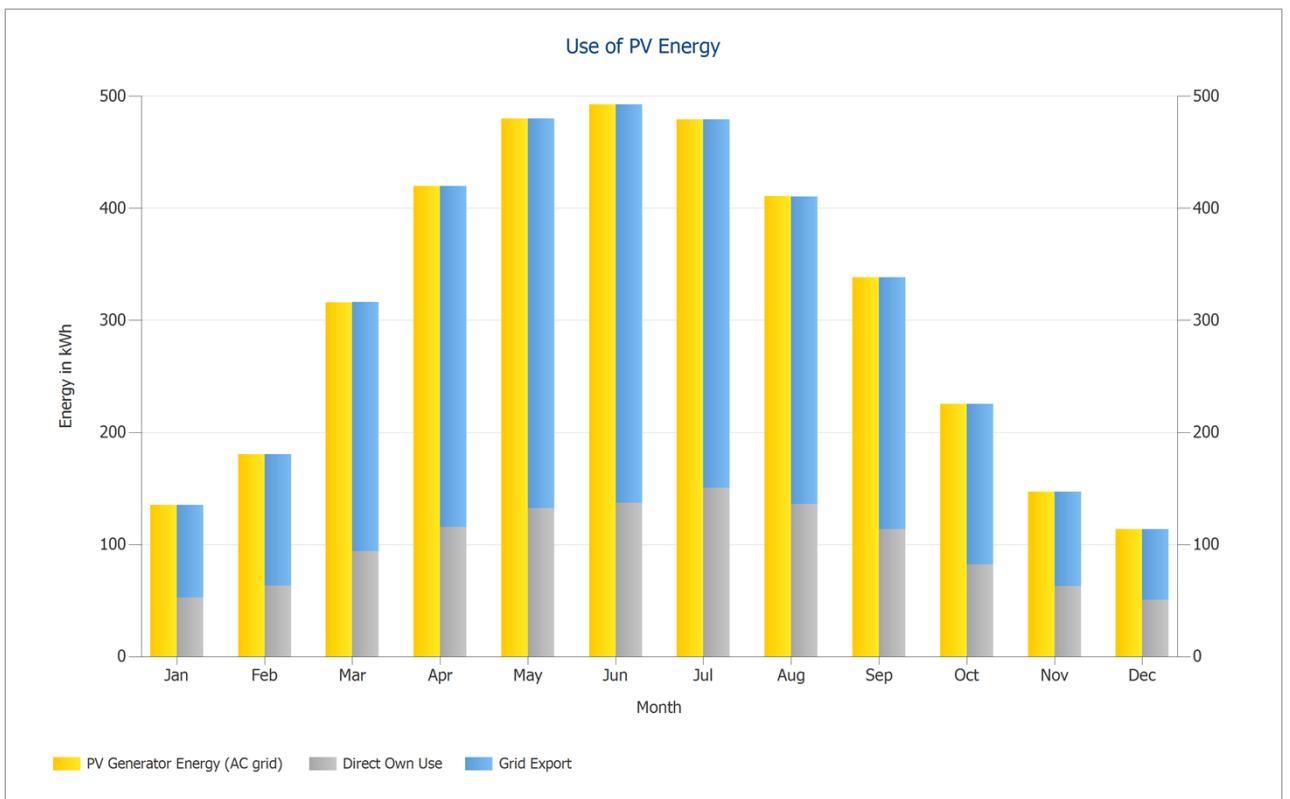


Figure: Use of PV Energy

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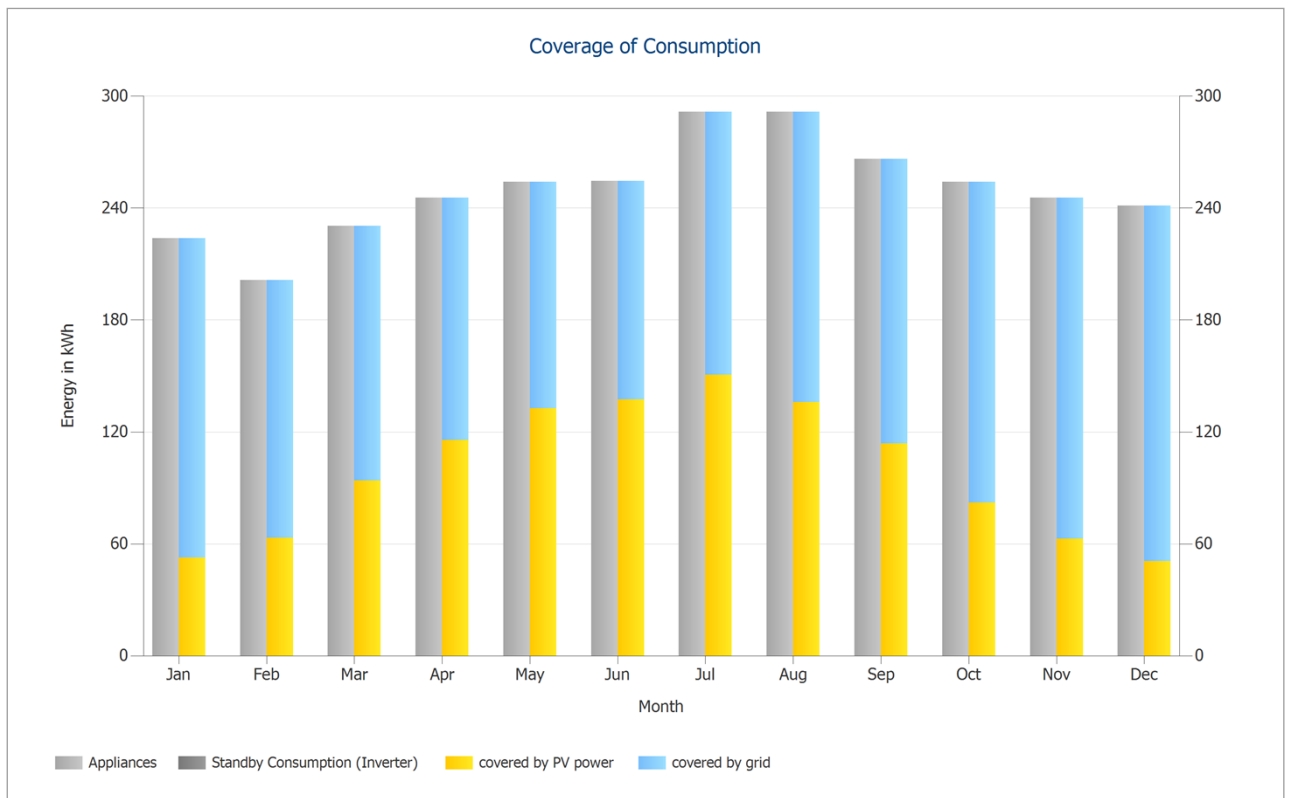


Figure: Coverage of Consumption

Results per Module Area

Building 01-Roof Area Southeast

PV Generator Output	3.65 kWp
PV Generator Surface	17.57 m ²
Global Radiation at the Module	1229.69 kWh/m ²
Global Radiation on Module without reflection	1253.37 kWh/m ²
Performance Ratio (PR)	81.81 %
PV Generator Energy (AC grid)	3738.38 kWh/Year
Spec. Annual Yield	1025.62 kWh/kWp

Data Sheets

PV Module Data Sheet

PV Module: JAM54S30-405/MR (v3)

Manufacturer	JA Solar Holdings Co., Ltd.
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	1 V
Integrated power optimizer	No
Only Transformer Inverters suitable	No

I/V Characteristics at STC

MPP Voltage	31.21 V
MPP Current	12.98 A
Open Circuit Voltage	37.23 V
Short-Circuit Current	13.87 A
Increase open circuit voltage before stabilisation	0 %
Nominal output	405 W
Fill Factor	78.45 %
Efficiency	20.75 %

I/V Part Load Characteristics

Values source	Manufacturer/user-created
Irradiance	200 W/m ²
Voltage in MPP at Part Load	30.2 V
Current in MPP at Part Load	2.64 A
Open Circuit Voltage (Part Load)	35 V
Short Circuit Current at Part Load	2.77 A

Additional Parameters

Temperature Coefficient of Voc	-102.4 mV/K
Temperature Coefficient of Isc	6.2 mA/K
Temperature Coefficient of Pmpp	-0.35 %/K
Incident Angle Modifier (IAM)	98 %
Maximum System Voltage	1500 V

Mechanical Data

Width	1134 mm
Height	1722 mm
Depth	30 mm
Frame Width	30 mm
Weight	21.5 kg

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Inverter Data Sheet

Inverter: RI-EnergyFlow-MIDI-3.6kW (v1)

Manufacturer	Rayleigh Instruments Ltd.
Available	Yes

Electrical data - DC

DC nominal output	3.6 kW
Max. DC Power	4.86 kW
Nom. DC Voltage	380 V
Max. Input Voltage	600 V
Max. Input Current	30 A
Max. short circuit current	30 A
Number of DC Inlets	4

Electrical data - AC

AC Power Rating	3.6 kW
Max. AC Power	3.6 kVA
Nom. AC Voltage	230 V
Number of Phases	1
With Transformer	No

Electrical data - other

Change in Efficiency when Input Voltage deviates from Rated Voltage	0 %/100V
Min. Feed-in Power	30 W
Standby Consumption	0.2 W
Night Consumption	0 W

MPP Tracker

Output Range < 20% of Power Rating	93.5 %
Output Range > 20% of Power Rating	97.8 %
Count of MPP Trackers	2

MPP Tracker 1-2

Max. Input Current	15 A
Max. short circuit current	15 A
Max. Input Power	2.43 kW
Min. MPP Voltage	80 V
Max. MPP Voltage	560 V

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Overview plan

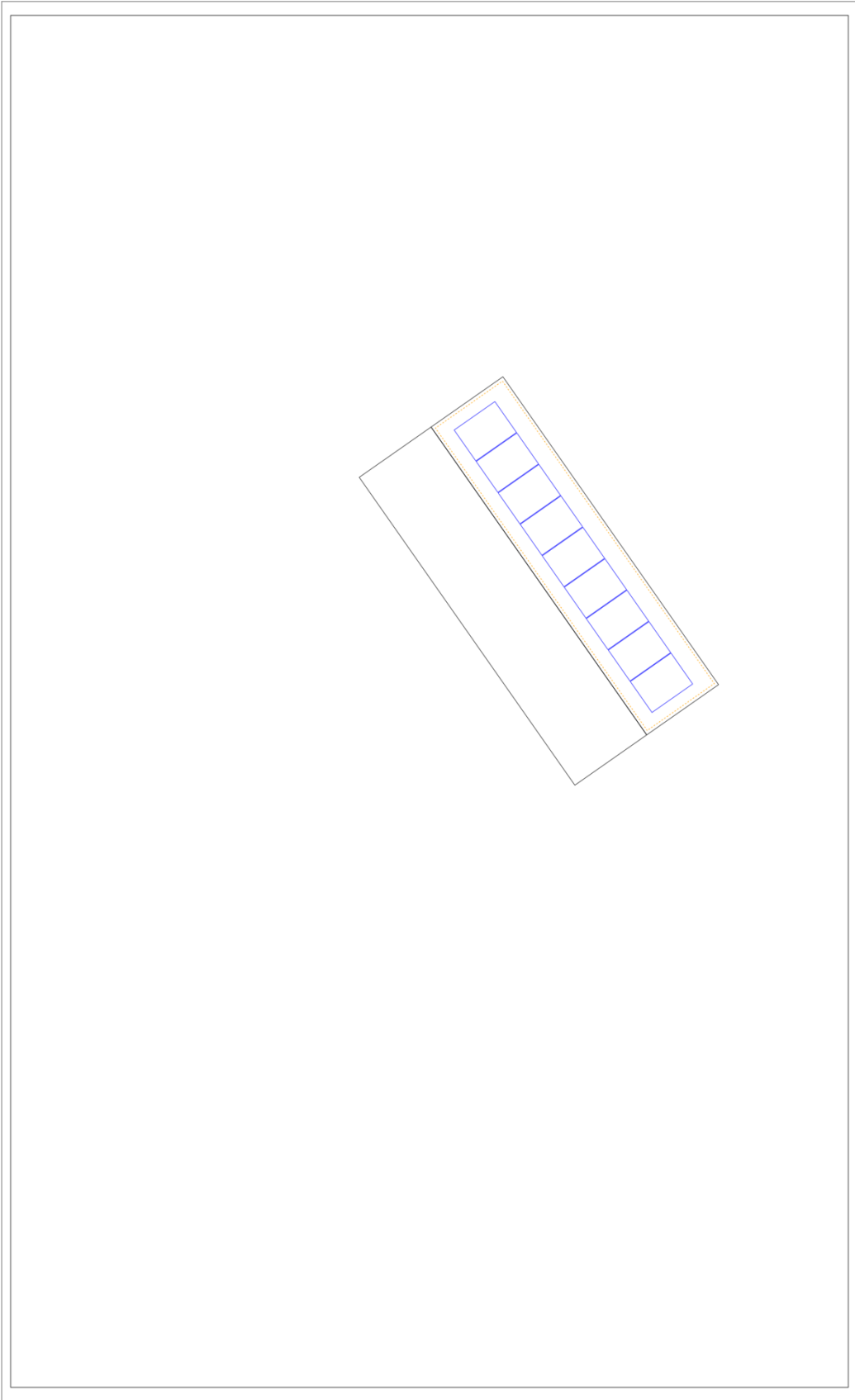


Figure: Overview plan

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Dimensioning Plan

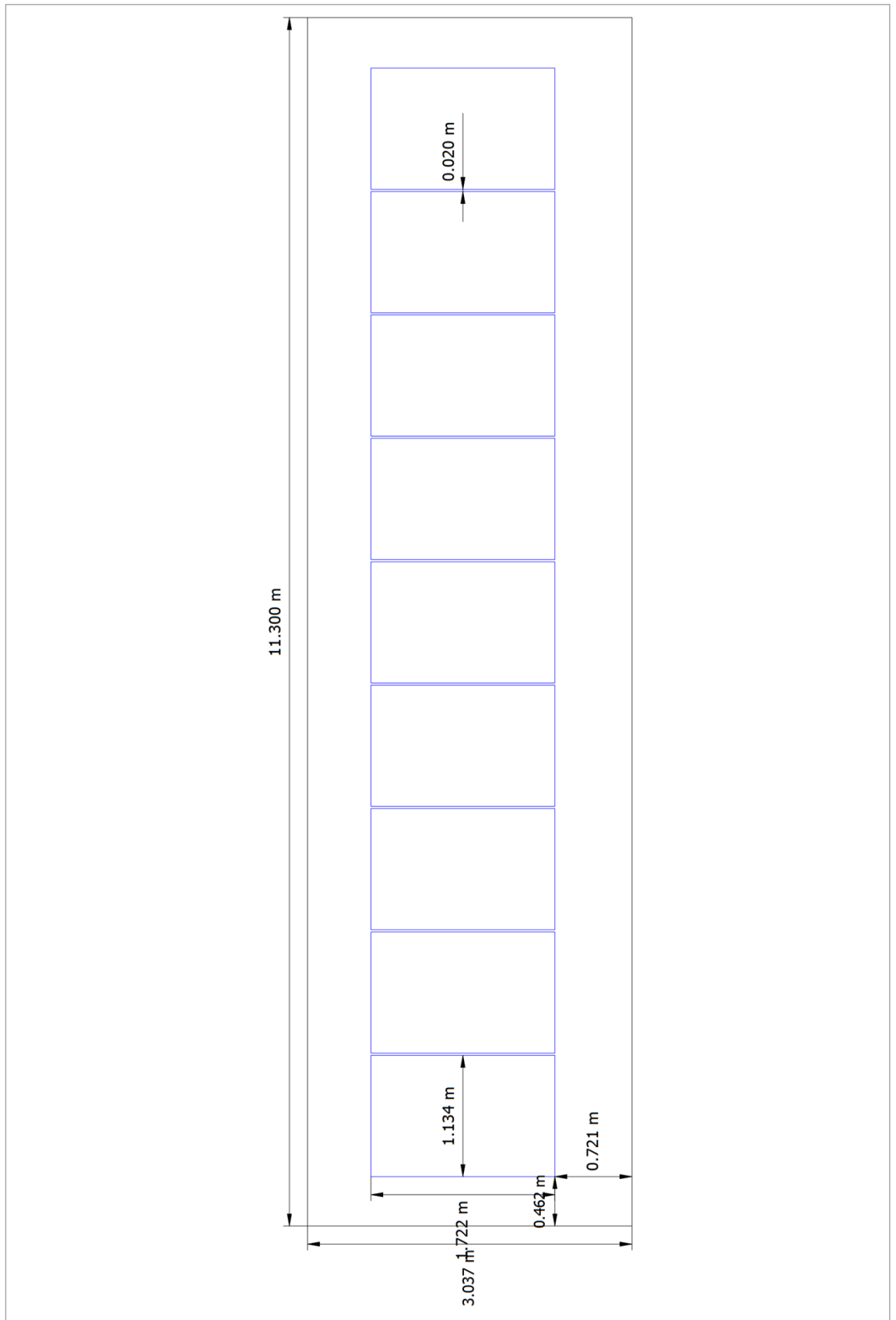


Figure: Building 01 - Roof Area Southeast

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String Plan

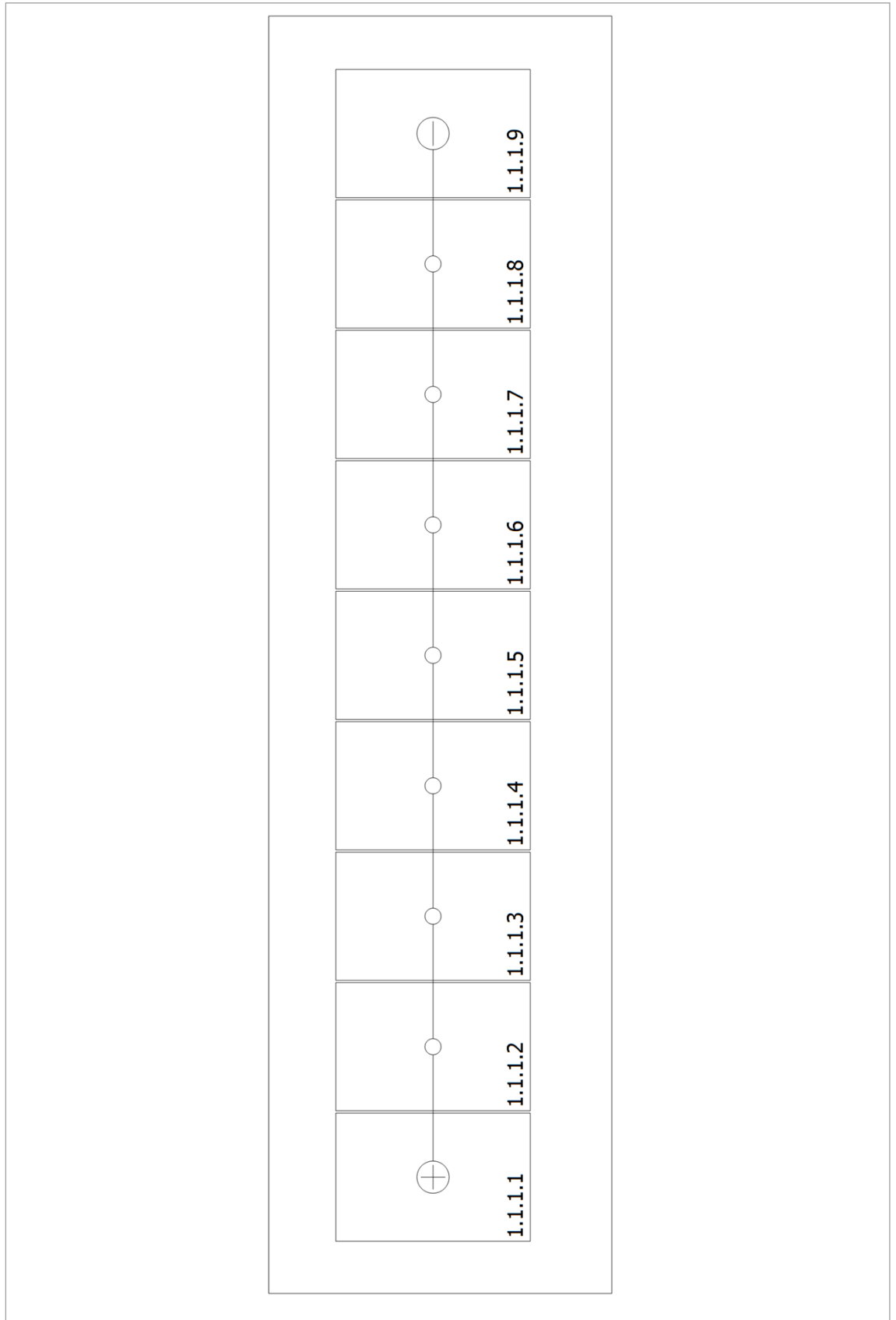


Figure: Building 01 - Roof Area Southeast