

Aarhus University

Zhe Zhang

Jens Chr. Skous Vej 2, 8000 Århus

Customer No.: Aarhus University**Project Name:** Jens Chr. Skous Vej 2, 8000**Offer no.:** Universitetets Energifælleskab

17-09-2024

Your PV system

Address of Installation

Jens Chr. Skous Vej 2,
8000



Project Overview



Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System

Climate Data	Aarhus, DNK (1996 - 2015)
Values source	Meteonorm 8.1(i)
PV Generator Output	48,6 kWp
PV Generator Surface	220,0 m ²
Number of PV Modules	90
Number of Inverters	1

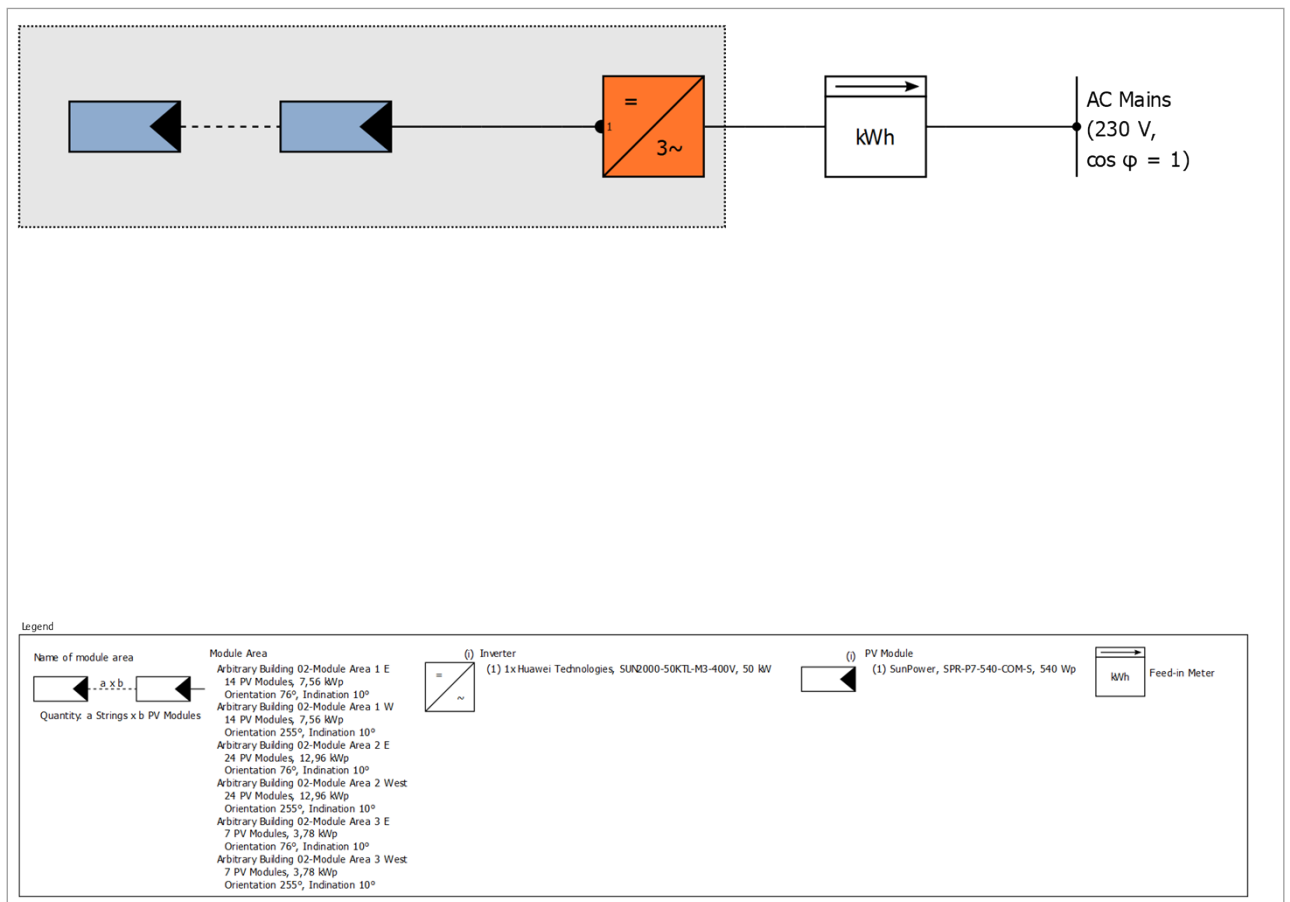


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	48,60 kWp
Spec. Annual Yield	926,17 kWh/kWp
Performance Ratio (PR)	91,74 %
Yield Reduction due to Shading	0,6 %
Grid Export	45.037 kWh/Year
Grid Export in the first year (incl. module degradation)	44.974 kWh/Year
Standby Consumption (Inverter)	25 kWh/Year
CO ₂ Emissions avoided	6.212 kg / year

Financial Analysis

Your Gain

Total investment costs	72.900,00 kr.
Internal Rate of Return (IRR)	0,00 %
Amortization Period	More than 20 Years
Electricity Production Costs	0,0897 kr./kWh
Energy Balance/Feed-in Concept	Full 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
Climate Data	
Location	Aarhus, DNK (1996 - 2015)
Values source	Meteonorm 8.1(i)
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Module Areas

1. Module Area - Arbitrary Building 02-Module Area 1 E

PV Generator, 1. Module Area - Arbitrary Building 02-Module Area 1 E	
Name	Arbitrary Building 02-Module Area 1 E
PV Modules	14 x SPR-P7-540-COM-S (v1)
Manufacturer	SunPower
Inclination	10 °
Orientation	East 76 °
Installation Type	Mounted - Roof
PV Generator Surface	34,2 m²



Figure: 1. Module Area - Arbitrary Building 02-Module Area 1 E

Degradation of Module, 1. Module Area - Arbitrary Building 02-Module Area 1 E

Characteristic curve	Exponential
Remaining power (power output) after 1 year	98,5 %
Remaining power (power output) after 25 years	89 %

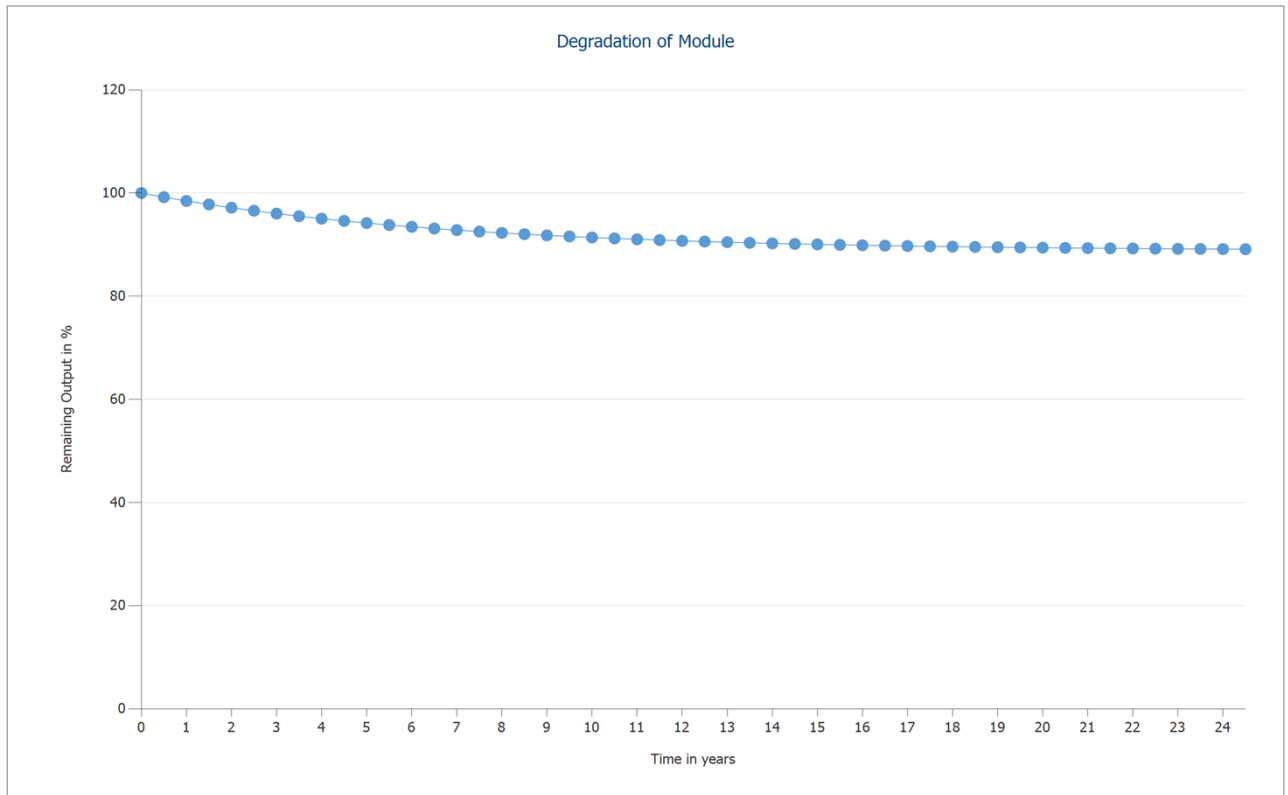


Figure: Degradation of Module, 1. Module Area - Arbitrary Building 02-Module Area 1 E

2. Module Area - Arbitrary Building 02-Module Area 1 W

PV Generator, 2. Module Area - Arbitrary Building 02-Module Area 1 W

Name	Arbitrary Building 02-Module Area 1 W
PV Modules	14 x SPR-P7-540-COM-S (v1)
Manufacturer	SunPower
Inclination	10 °
Orientation	West 255 °
Installation Type	Mounted - Roof
PV Generator Surface	34,2 m²

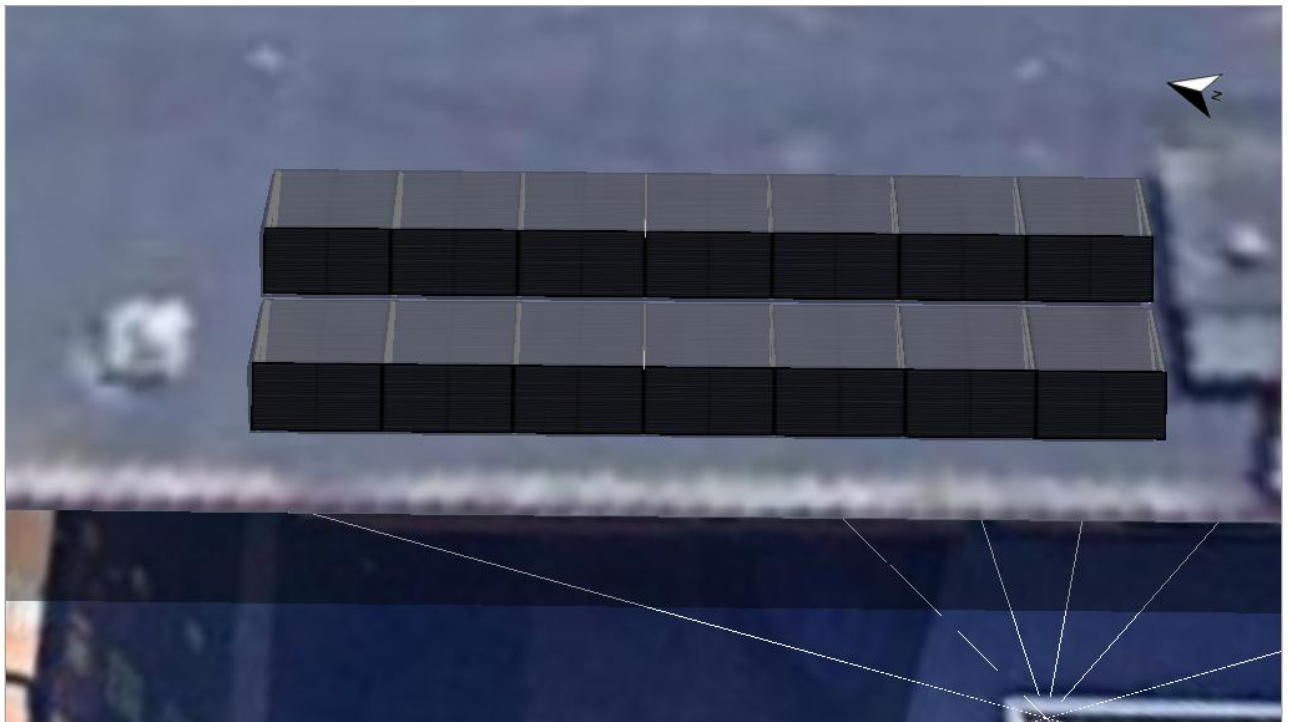


Figure: 2. Module Area - Arbitrary Building 02-Module Area 1 W

Degradation of Module, 2. Module Area - Arbitrary Building 02-Module Area 1 W

Characteristic curve

Linear (straight line)

Remaining power (power output) after 25 years

89 %

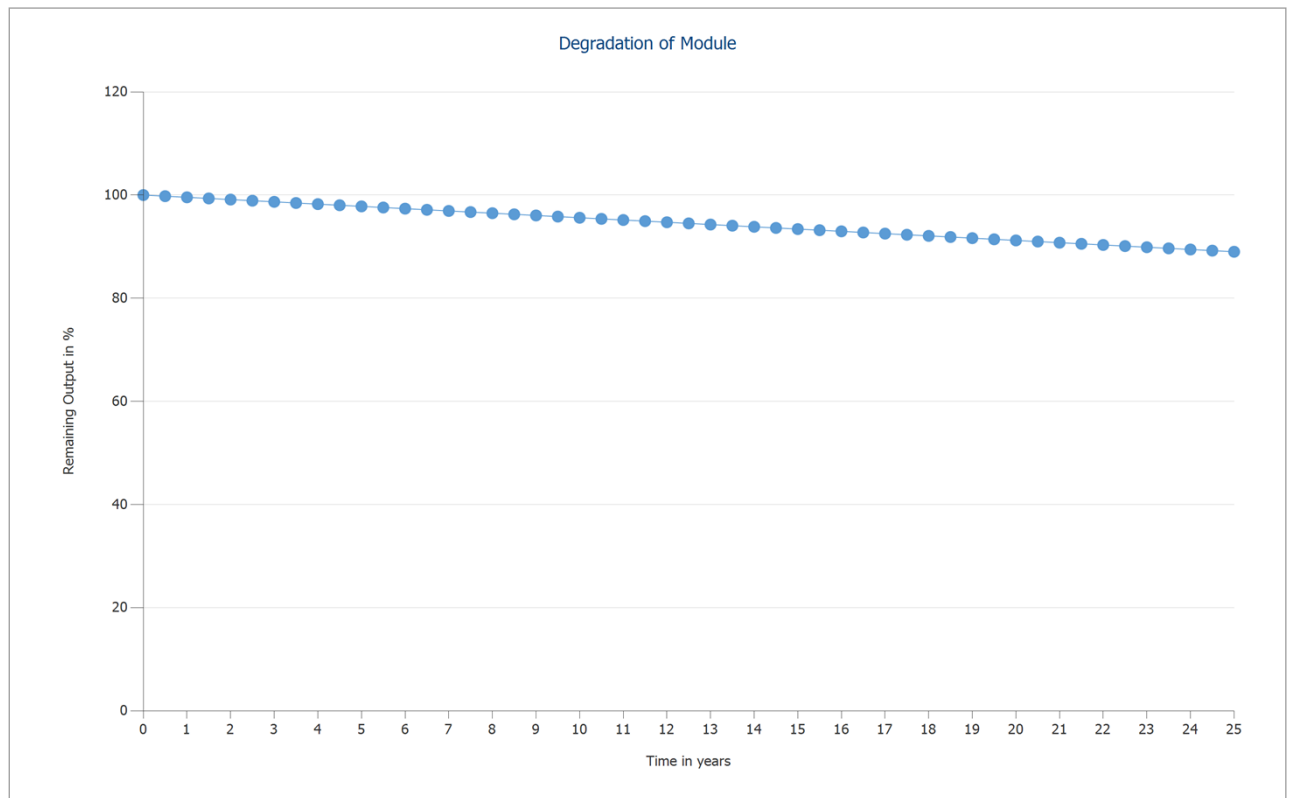


Figure: Degradation of Module, 2. Module Area - Arbitrary Building 02-Module Area 1 W

3. Module Area - Arbitrary Building 02-Module Area 2 E

PV Generator, 3. Module Area - Arbitrary Building 02-Module Area 2 E

Name	Arbitrary Building 02-Module Area 2 E
PV Modules	24 x SPR-P7-540-COM-S (v1)
Manufacturer	SunPower
Inclination	10 °
Orientation	East 76 °
Installation Type	Mounted - Roof
PV Generator Surface	58,7 m²



Figure: 3. Module Area - Arbitrary Building 02-Module Area 2 E

Degradation of Module, 3. Module Area - Arbitrary Building 02-Module Area 2 E

Characteristic curve

Linear (straight line)

Remaining power (power output) after 20 years

100 %

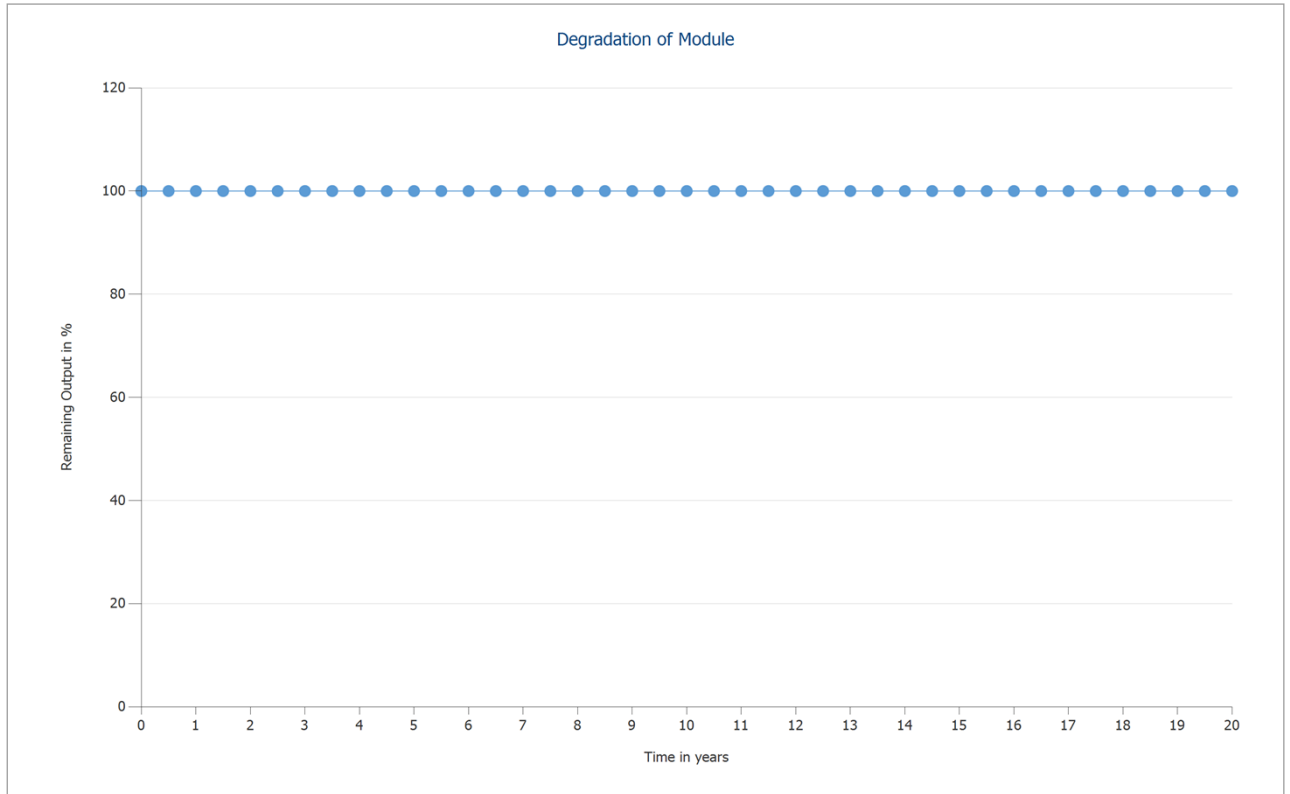


Figure: Degradation of Module, 3. Module Area - Arbitrary Building 02-Module Area 2 E

4. Module Area - Arbitrary Building 02-Module Area 2 West

PV Generator, 4. Module Area - Arbitrary Building 02-Module Area 2 West

Name	Arbitrary Building 02-Module Area 2 West
PV Modules	24 x SPR-P7-540-COM-S (v1)
Manufacturer	SunPower
Inclination	10 °
Orientation	West 255 °
Installation Type	Mounted - Roof
PV Generator Surface	58,7 m ²



Figure: 4. Module Area - Arbitrary Building 02-Module Area 2 West

Degradation of Module, 4. Module Area - Arbitrary Building 02-Module Area 2 West

Characteristic curve

Linear (straight line)

Remaining power (power output) after 20 years

100 %

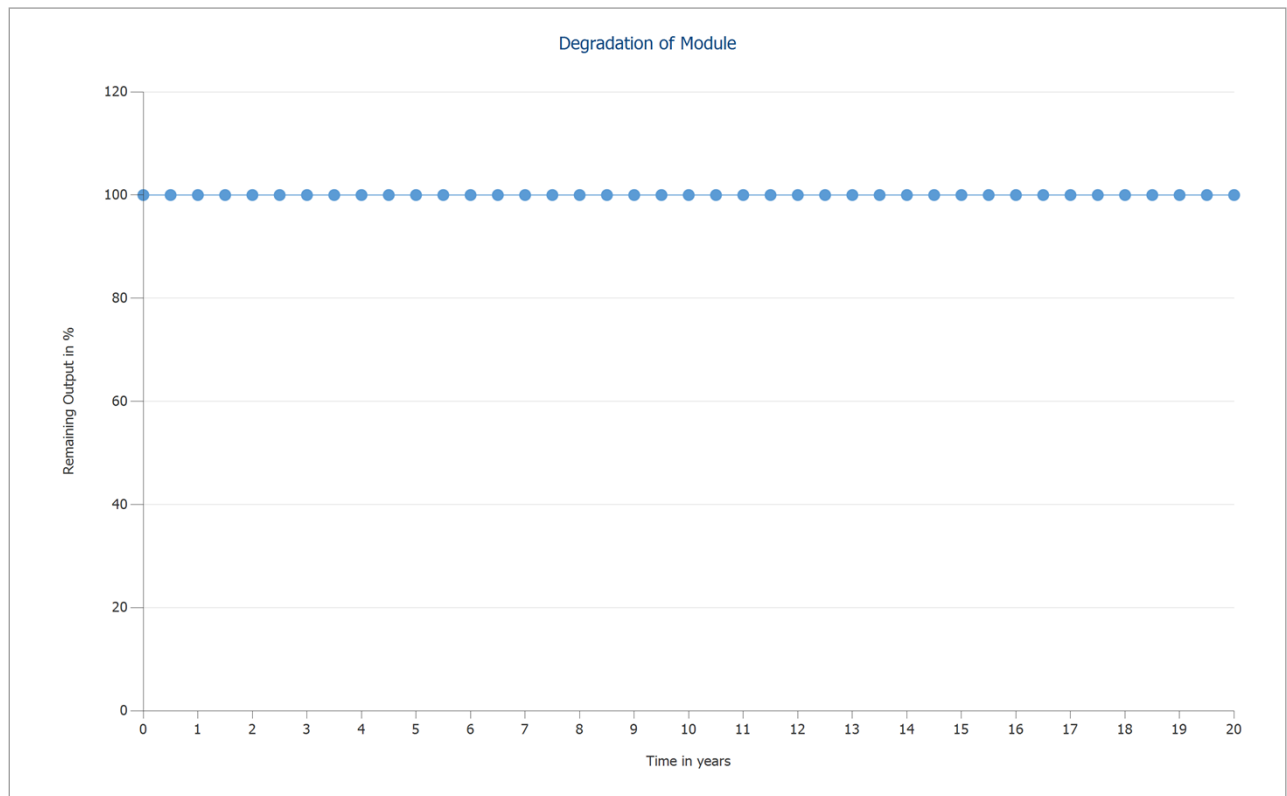


Figure: Degradation of Module, 4. Module Area - Arbitrary Building 02-Module Area 2 West

5. Module Area - Arbitrary Building 02-Module Area 3 E

PV Generator, 5. Module Area - Arbitrary Building 02-Module Area 3 E

Name	Arbitrary Building 02-Module Area 3 E
PV Modules	7 x SPR-P7-540-COM-S (v1)
Manufacturer	SunPower
Inclination	10 °
Orientation	East 76 °
Installation Type	Mounted - Roof
PV Generator Surface	17,1 m²

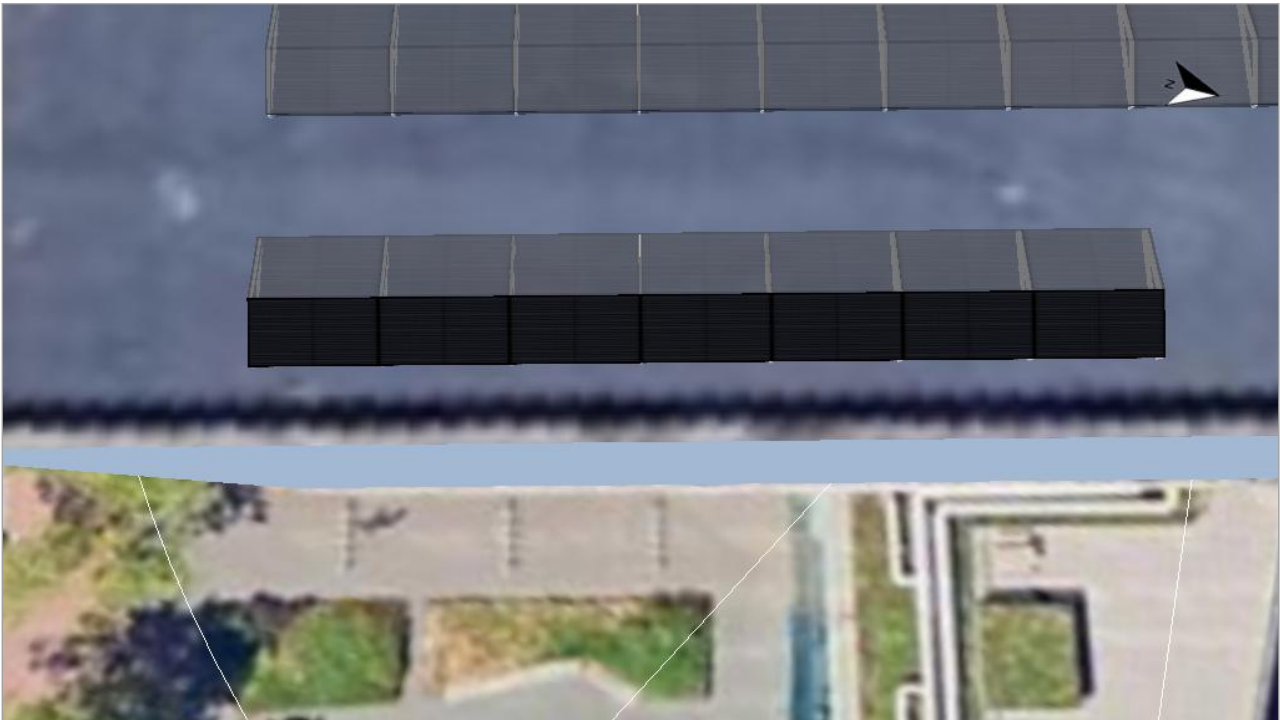


Figure: 5. Module Area - Arbitrary Building 02-Module Area 3 E

Degradation of Module, 5. Module Area - Arbitrary Building 02-Module Area 3 E

Characteristic curve

Linear (straight line)

Remaining power (power output) after 20 years

100 %

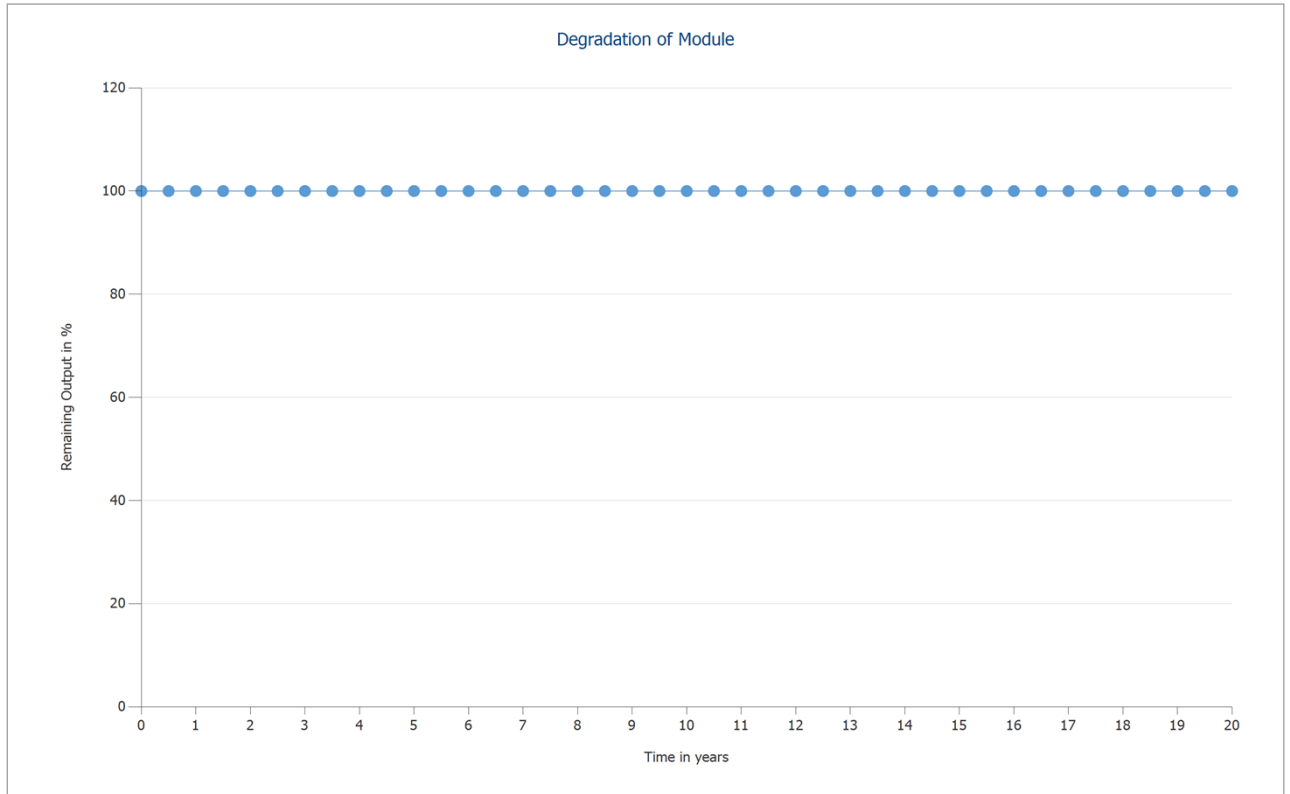


Figure: Degradation of Module, 5. Module Area - Arbitrary Building 02-Module Area 3 E

6. Module Area - Arbitrary Building 02-Module Area 3 West

PV Generator, 6. Module Area - Arbitrary Building 02-Module Area 3 West

Name	Arbitrary Building 02-Module Area 3 West
PV Modules	7 x SPR-P7-540-COM-S (v1)
Manufacturer	SunPower
Inclination	10 °
Orientation	West 255 °
Installation Type	Mounted - Roof
PV Generator Surface	17,1 m²

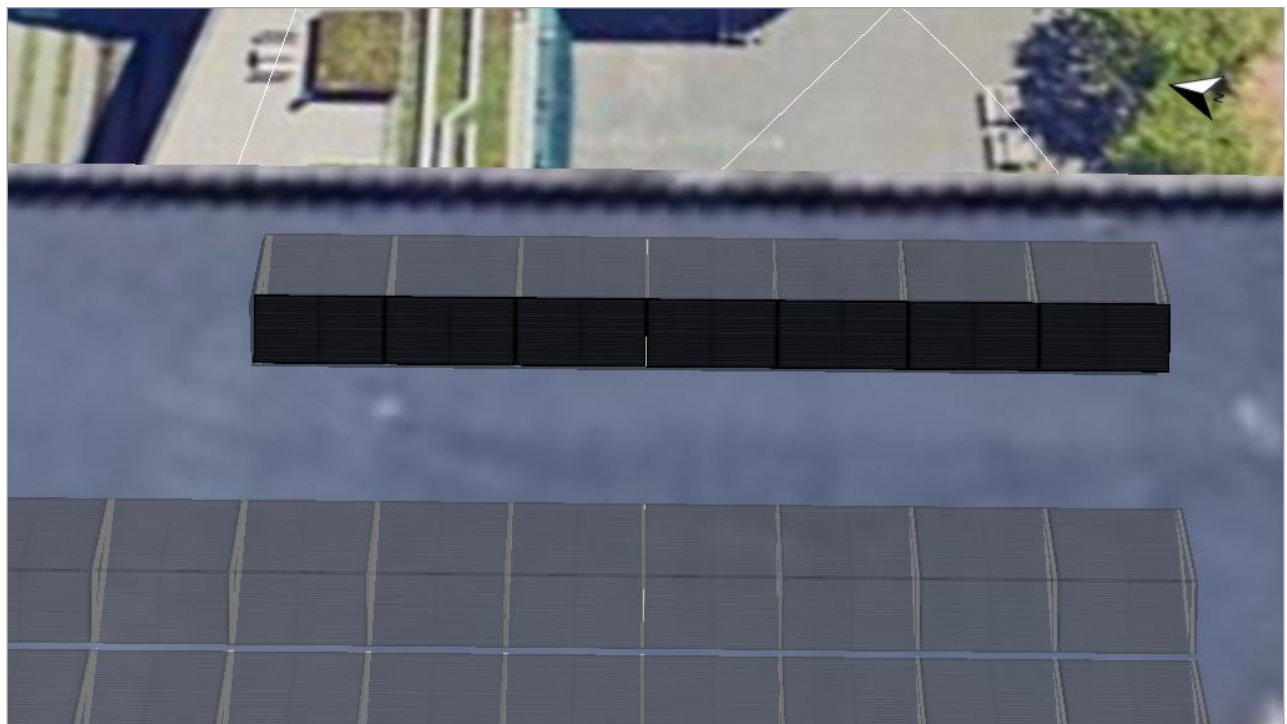


Figure: 6. Module Area - Arbitrary Building 02-Module Area 3 West

Degradation of Module, 6. Module Area - Arbitrary Building 02-Module Area 3 West

Characteristic curve	Linear (straight line)
Remaining power (power output) after 20 years	100 %

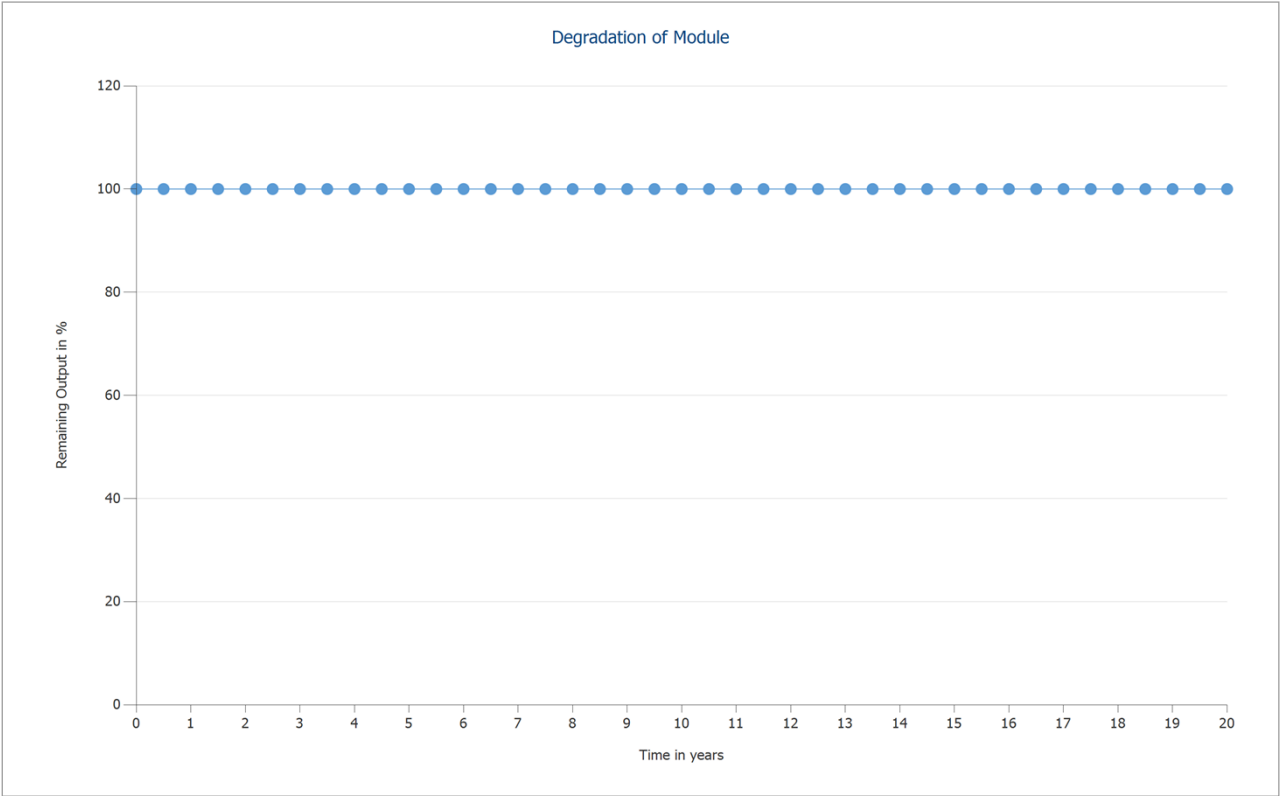


Figure: Degradation of Module, 6. Module Area - Arbitrary Building 02-Module Area 3 West

Horizon Line, 3D Design

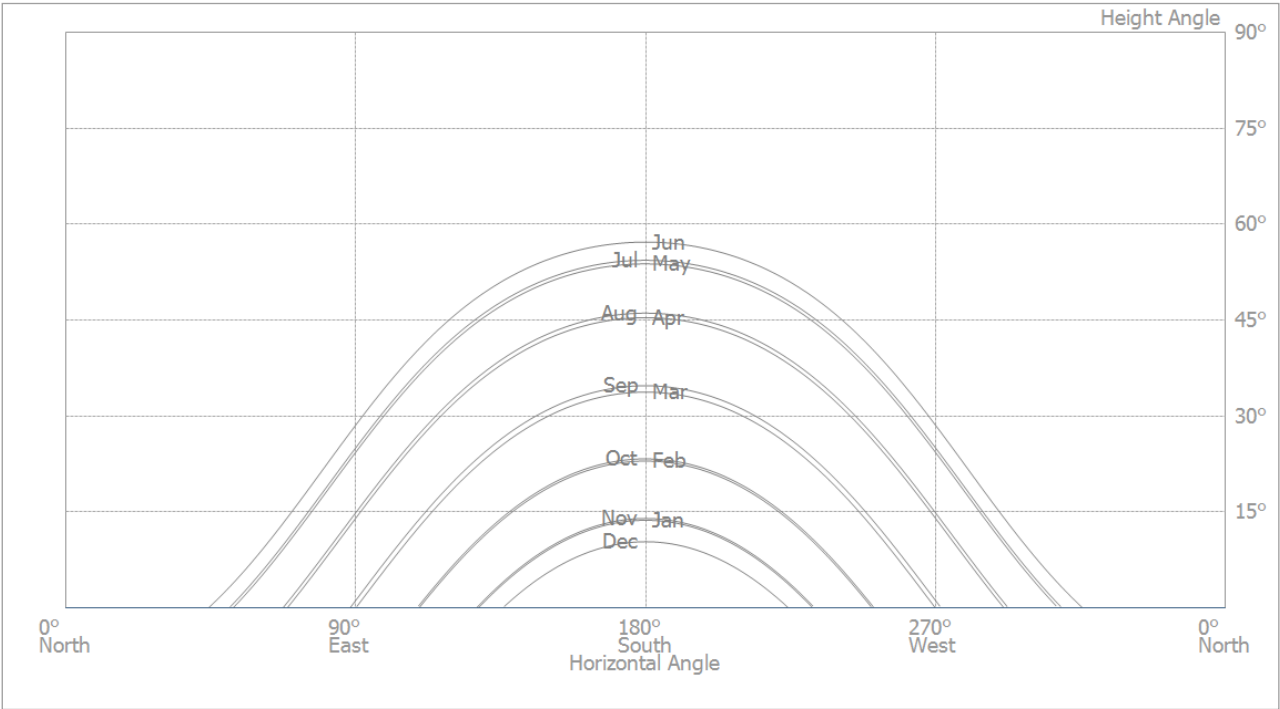


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Areas	Arbitrary Building 02-Module Area 1 E + Arbitrary Building 02-Module Area 1 W + Arbitrary Building 02-Module Area 2 E + Arbitrary Building 02-Module Area 2 West + Arbitrary Building 02-Module Area 3 E + Arbitrary Building 02-Module Area 3 West		
Inverter 1			
Model	SUN2000-50KTL-M3-400V (v2)		
Manufacturer	Huawei Technologies		
Quantity	1		
Sizing Factor	97,2 %		
Configuration	MPP 1:		
	1 x 14 1 x 14		
	MPP 2:		
	2 x 12		
	MPP 3:		
	2 x 12		
	MPP 4:		
	1 x 7 1 x 7		

AC Mains

AC Mains

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

Simulation Results

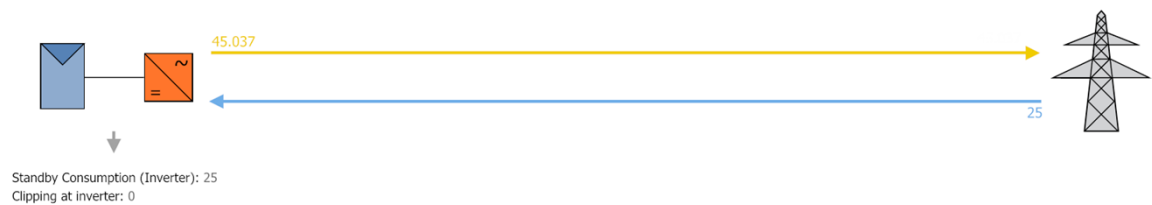
Results Total System

PV System

PV Generator Output	48,60 kWp
Spec. Annual Yield	926,17 kWh/kWp
Performance Ratio (PR)	91,74 %
Yield Reduction due to Shading	0,6 %
Grid Export	45.037 kWh/Year
Grid Export in the first year (incl. module degradation)	44.974 kWh/Year
Standby Consumption (Inverter)	25 kWh/Year
CO ₂ Emissions avoided	6.212 kg / year

Energy Flow Graph

Project: Jens Chr. Skous Vej 2, 8000



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

Figure: Energy flow

Jens Chr. Skous Vej 2, 8000

Offer Number: Universitetets Energifælleskab

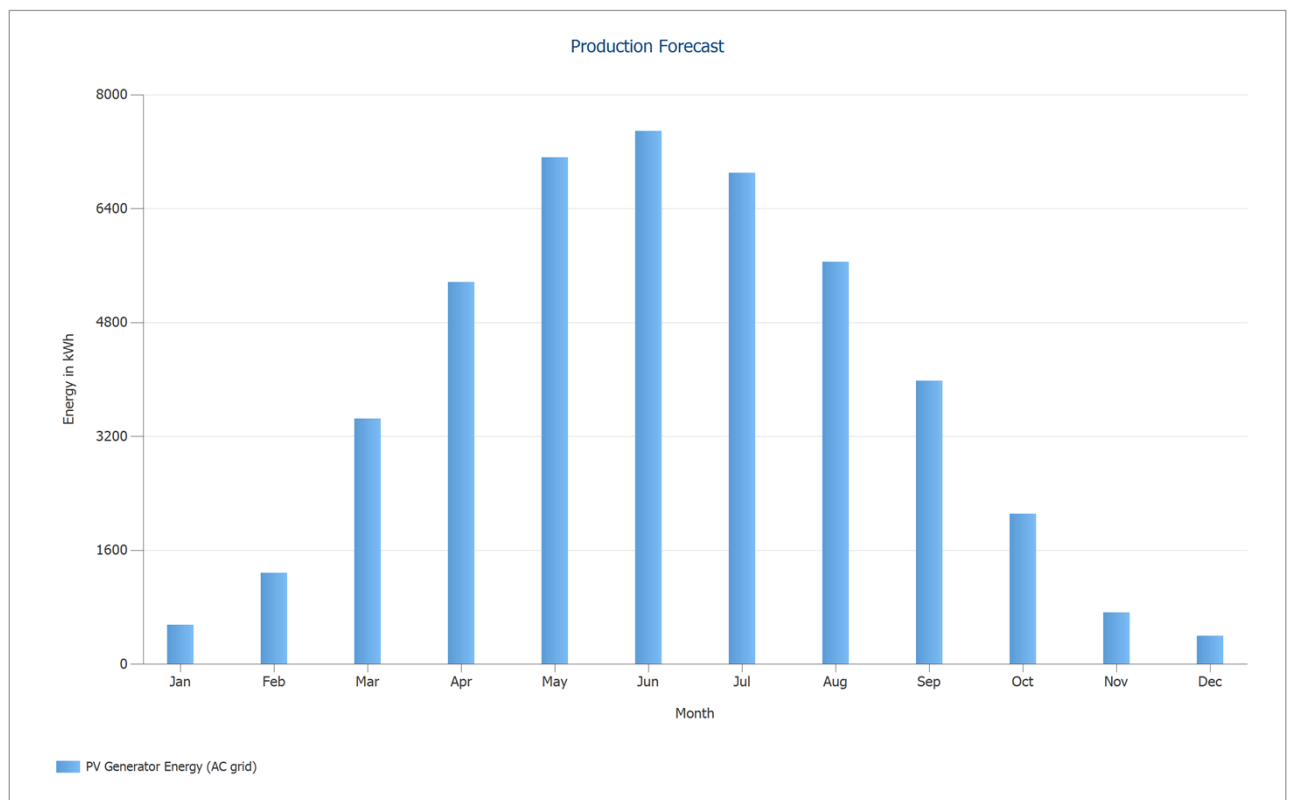


Figure: Production Forecast

Data Sheets

PV Module Data Sheet

PV Module: SPR-P7-540-COM-S (v1)

Manufacturer	SunPower
Available	Yes

Electrical Data

Cell Type	Si monocrystalline
Half-cell module	No
Cell Count	210
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	42,63 V
MPP Current	12,67 A
Open Circuit Voltage	50,34 V
Short-Circuit Current	13,42 A
Increase open circuit voltage before stabilisation	0 %
Nominal output	540 W
Fill Factor	79,95 %
Efficiency	22,09 %

I/V Part Load Characteristics (calculated)

Values source	Standard (PV*SOL Model)
Irradiance	200 W/m ²
Voltage in MPP at Part Load	40,29 V
Current in MPP at Part Load	2,53 A
Open Circuit Voltage (Part Load)	45,31 V
Short Circuit Current at Part Load	2,68 A

Additional Parameters

Temperature Coefficient of Voc	-140 mV/K
Temperature Coefficient of Isc	6,04 mA/K
Temperature Coefficient of Pmpp	-0,29 %/K
Incident Angle Modifier (IAM)	100 %
Bifacial factor	78 %
Maximum System Voltage	1500 V

Mechanical Data

Width	1134 mm
Height	2156 mm
Depth	35 mm
Frame Width	7 mm
Weight	30,3 kg

Inverter Data Sheet

Inverter: SUN2000-50KTL-M3-400V (v2)

Manufacturer	Huawei Technologies
Available	Yes
Electrical data - DC	
DC nominal output	50,86 kW
Max. DC Power	75 kW
Nom. DC Voltage	600 V
Max. Input Voltage	1100 V
Max. Input Current	120 A
Max. short circuit current	160 A
Number of DC Inlets	8
Electrical data - AC	
AC Power Rating	50 kW
Max. AC Power	55 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	75 W
Standby Consumption	5,5 W
Night Consumption	5,5 W
MPP Tracker	
Output Range < 20% of Power Rating	99,95 %
Output Range > 20% of Power Rating	99,99 %
Count of MPP Trackers	4
MPP Tracker 1-4	
Max. Input Current	30 A
Max. short circuit current	30 A
Max. Input Power	20 kW
Min. MPP Voltage	200 V
Max. MPP Voltage	1000 V

Plans and parts list

Circuit Diagram

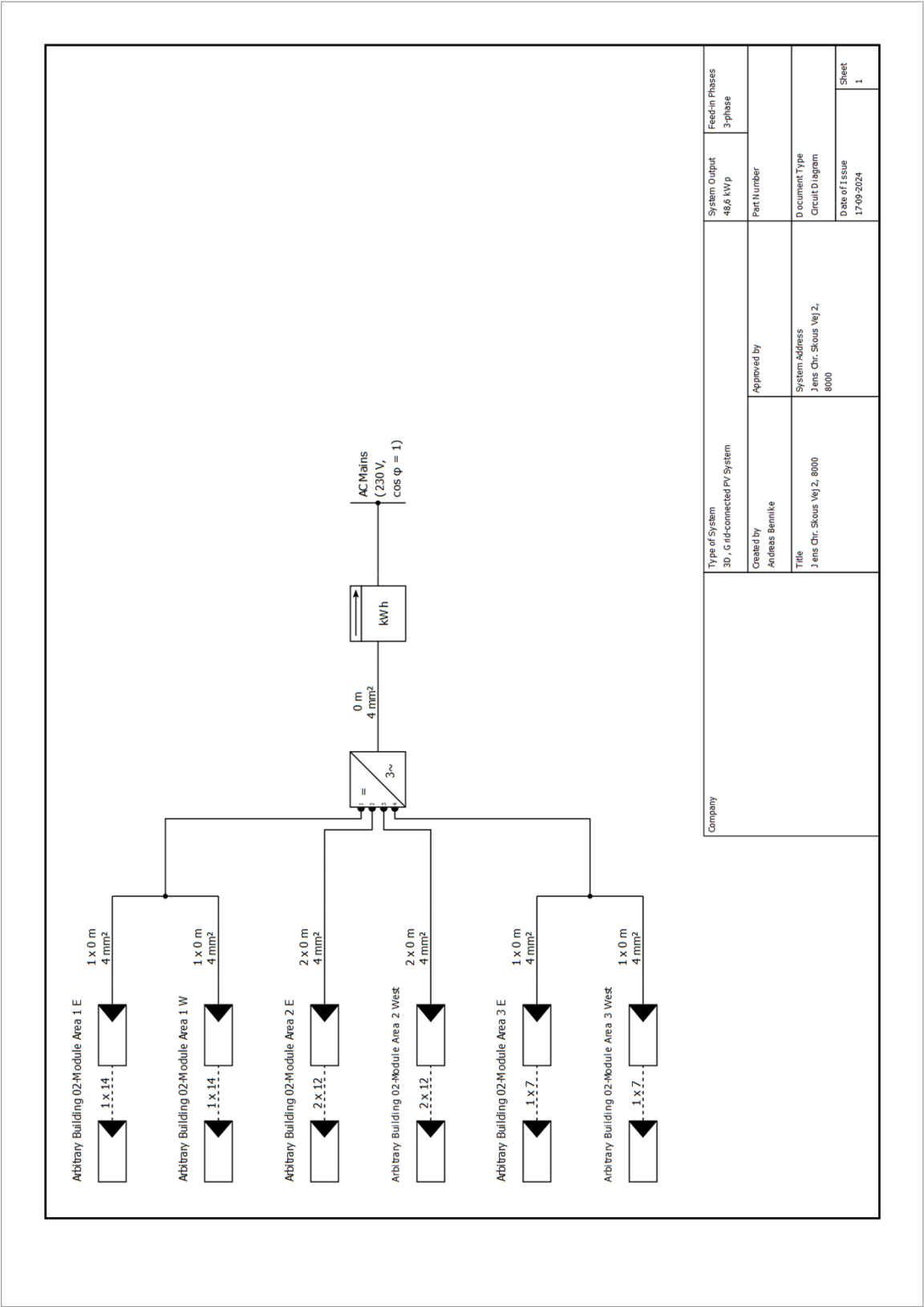


Figure: Circuit Diagram

Overview plan

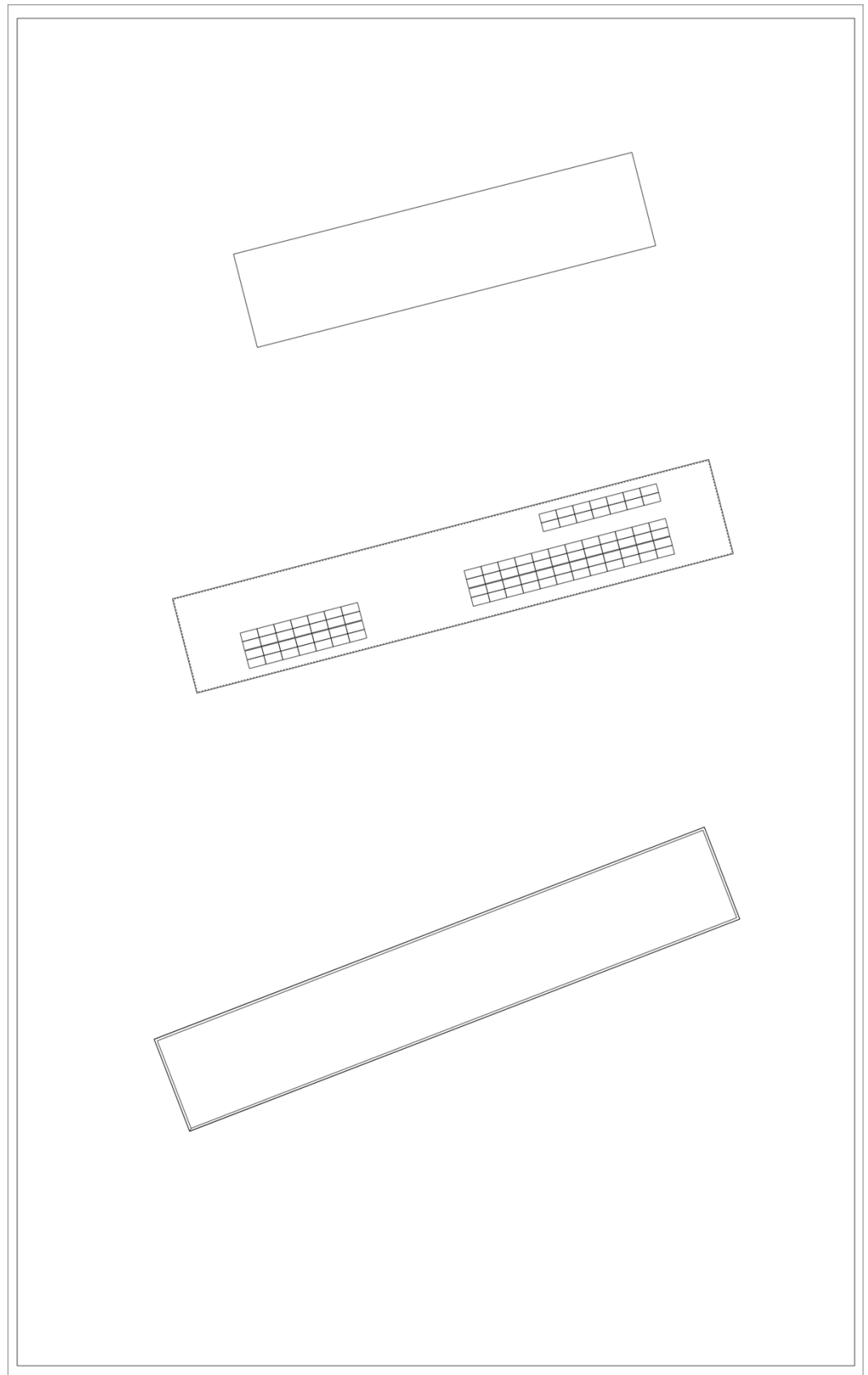


Figure: Overview plan

Dimensioning Plan

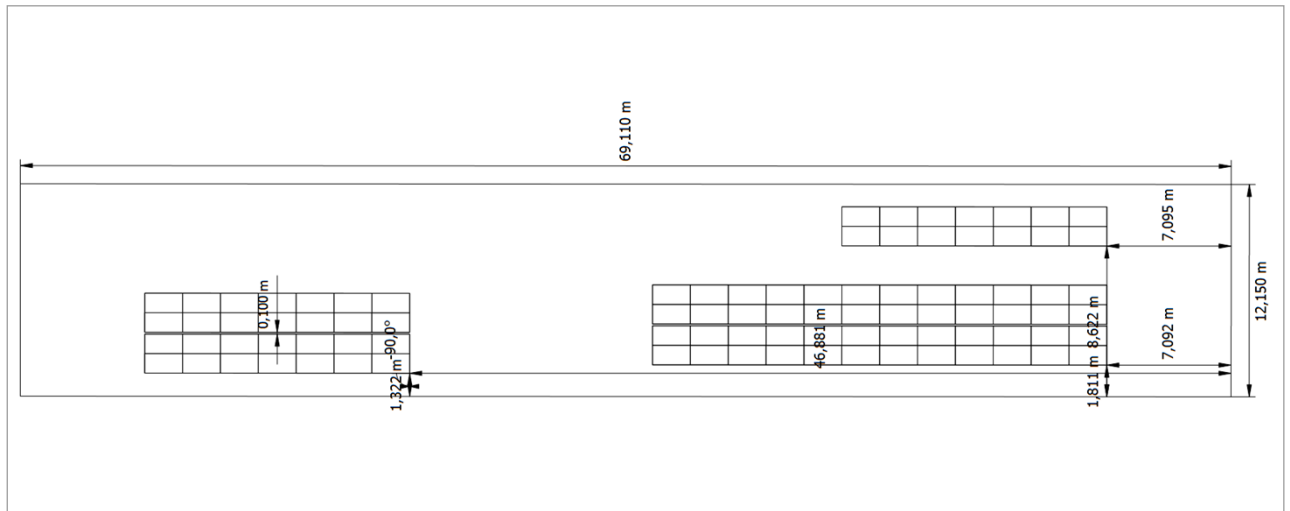


Figure: Arbitrary Building 02 - Mounting Surface South

String Plan

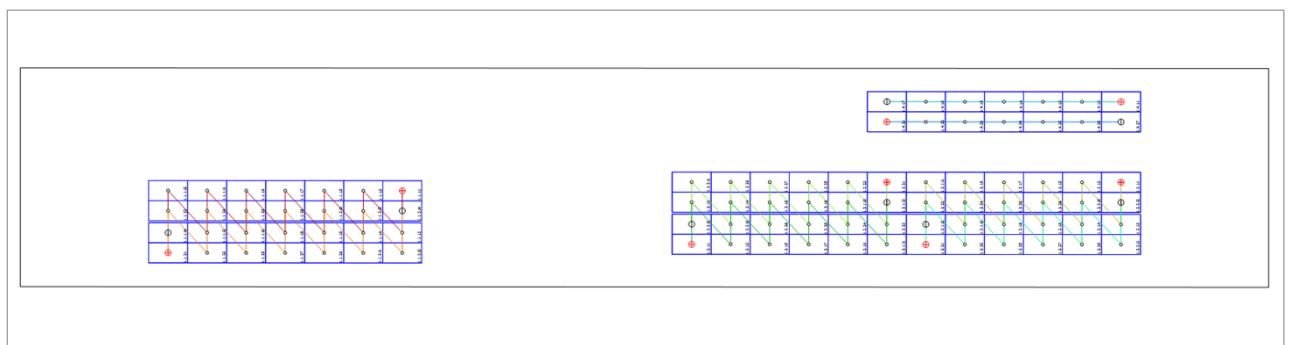


Figure: Arbitrary Building 02 - Mounting Surface South

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		SunPower	SPR-P7-540-COM-S	90	Piece
2	Inverter		Huawei Technologies	SUN2000-50KTL-M3-400V	1	Piece
3	Components			Feed-in Meter	1	Piece

Screenshots, 3D Design Shading



Figure: Screenshot01