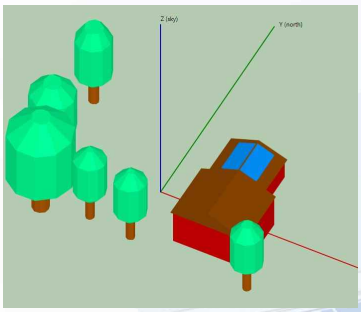
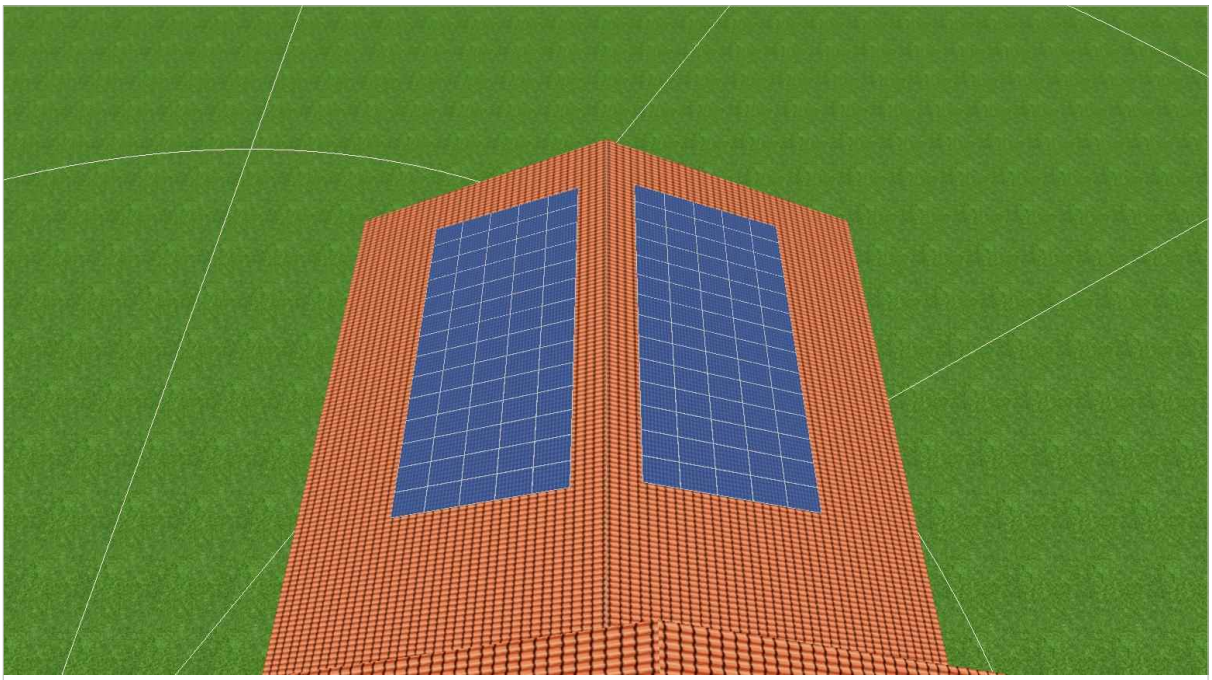
Company

Please enter in Options > User data.

Client

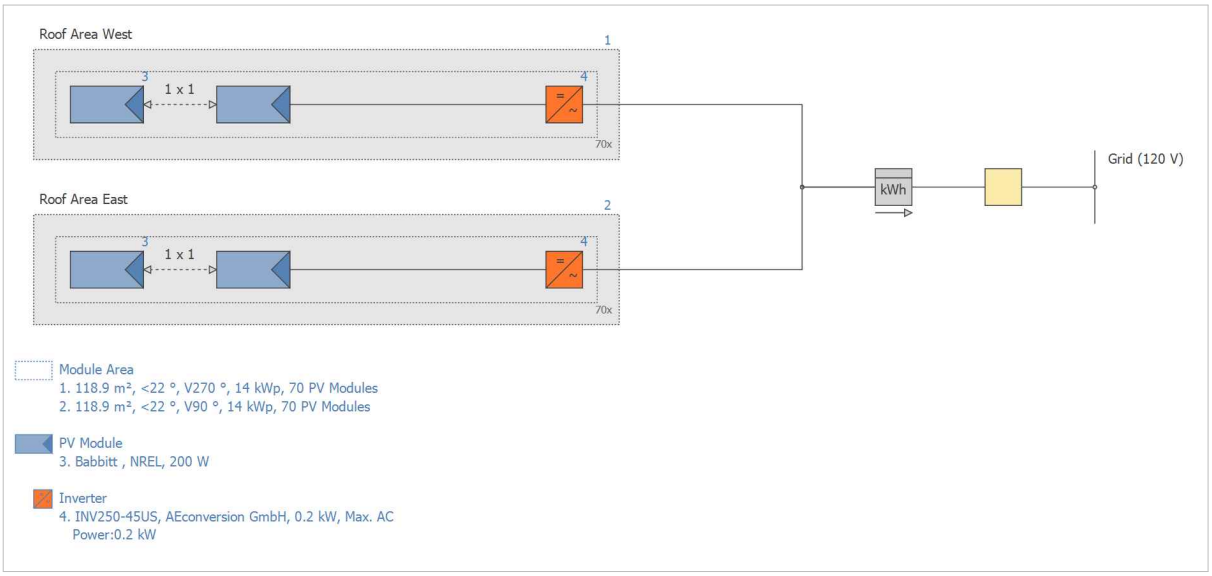
Project





3D, Grid Connected PV System

Climate Data	VAN NUYS AIRPORT (1991 - 2005)	
PV Generator Output	28	kWp
PV Generator Surface	237.8	m²
Number of PV Modules	140	
Number of Inverters	140	



The yield		
PV Generator Energy (AC grid)	36,310	kWh
Spec. Annual Yield	1,296.78	kWh/kWp
Performance Ratio (PR)	72.6	%
Calculation of Shading Losses	8.1	%/year
CO_2 Emissions avoided	21,775	kg / year

Your Gain		
Total investment costs	42,000.00	$
Return on Assets	3.55	%
Amortization Period	15.8	Years
Electricity Production Costs	0.06	$/kWh

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

Climate Data	VAN NUYS AIRPORT
Type of System	3D, Grid Connected PV System

PV Generator 1. Module Area

Name	Roof Area West	
PV Modules*	70 x Babbitt	
Manufacturer	NREL	
Inclination	22	°
Orientation	West 270	°
Installation Type	Roof parallel	
PV Generator Surface	118.9	m²

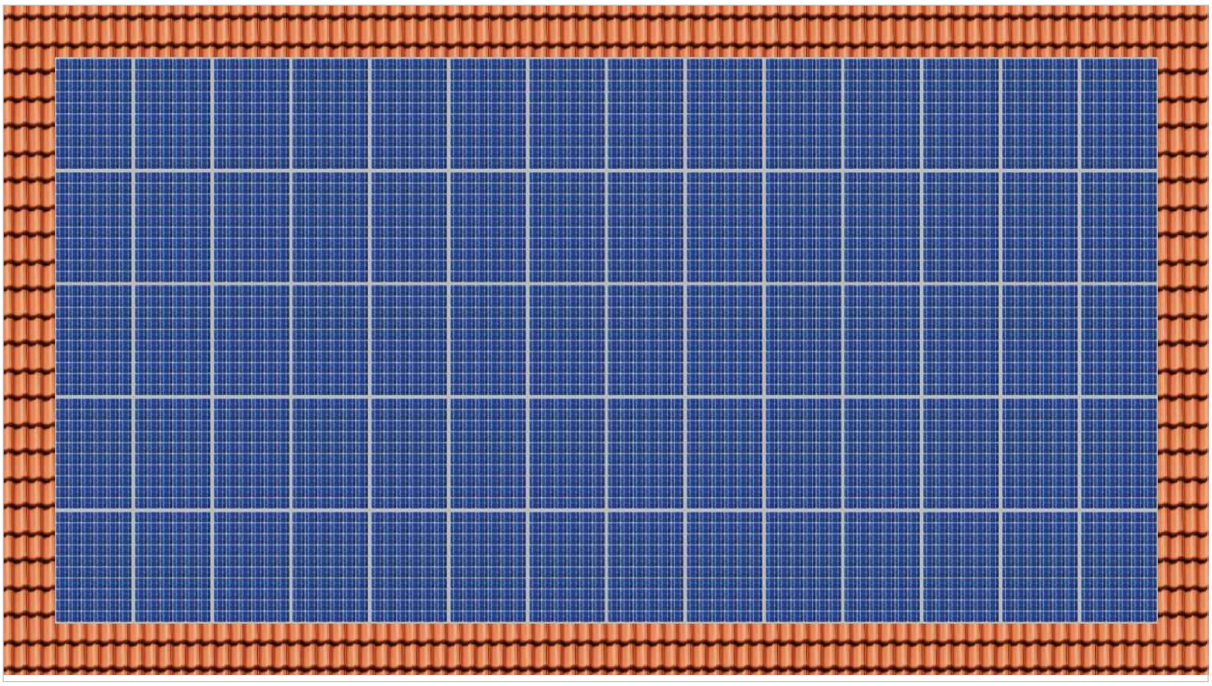


Figure: 3D Design for Roof Area West

Losses

PV Generator 2. Module Area

Name	Roof Area East	
PV Modules*	70 x Babbitt	
Manufacturer	NREL	
Inclination	22	°
Orientation	East 90	°
Installation Type	Roof parallel	
PV Generator Surface	118.9	m²

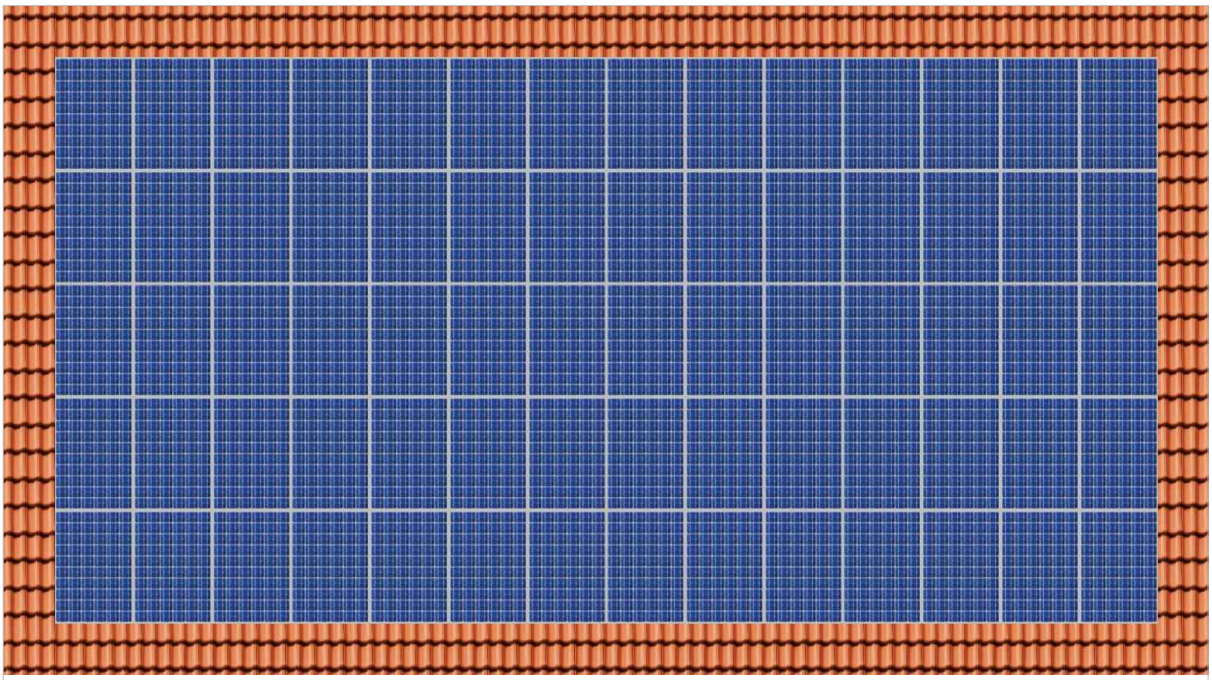


Figure: 3D Design for Roof Area East

Losses

Inverter	
1. Module Area	**Roof Area West**
Inverter 1*	70 x INV250-45US
Manufacturer	AEconversion GmbH
Configuration	MPP 1: 1 x 1
2. Module Area	**Roof Area East**
Inverter 1*	70 x INV250-45US
Manufacturer	AEconversion GmbH
Configuration	MPP 1: 1 x 1

AC Mains	
Number of Phases	3
Mains Voltage (1-phase)	120 V
Displacement Power Factor (cos phi)	+/- 1

Cable	
Max. Total Loss	0 %

* The guarantee provisions of the respective manufacturer apply

Simulation Results

PV System

PV Generator Output	28	kWp
Spec. Annual Yield	1,296.78	kWh/kWp
Performance Ratio (PR)	72.6	%
Yield Reduction due to Shading	8.1	%/year
Grid Feed-in	36,310	kWh/year
Grid Feed-in in the first year (incl. module degradation)	36,310	kWh/year
Stand-by Consumption	19	kWh/year
CO_2 Emissions avoided	21,775	kg / year

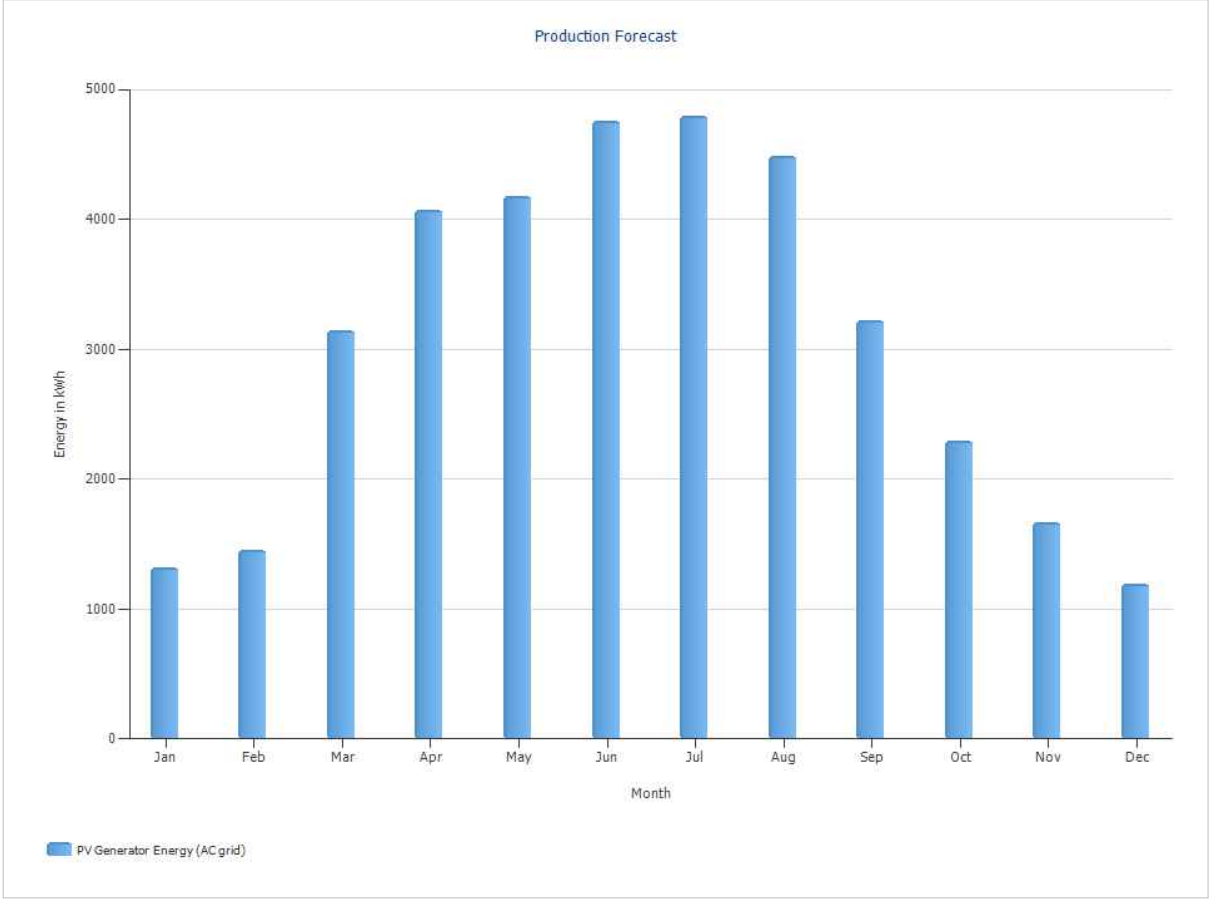


Figure: Production Forecast

PV System Energy Balance

Global radiation - horizontal	**1,912.0**	**kWh/m²**	
Deviation from standard spectrum	-19.12	kWh/m²	-1.00 %
Orientation and inclination of the module surface	-92.24	kWh/m²	-4.87 %
Shading of diffuse radiation by horizon	-15.12	kWh/m²	-0.84 %
Reflection on the Module Interface	-91.88	kWh/m²	-5.15 %
Global Radiation at the Module	**1,693.6**	**kWh/m²**	
	1,693.6	kWh/m²	
	x 237.84	m²	
	= 402,808.9	kWh	
Global PV Radiation	**402,808.9**	**kWh**	
Soiling	0.00	kWh	0.00 %
STC Conversion (Rated Efficiency of Module 11.78 %)	-355,364.66	kWh	-88.22 %
Rated PV Energy	**47,444.3**	**kWh**	
Module-specific Partial Shading	-2,421.62	kWh	-5.10 %
Low-light performance	-1,508.51	kWh	-3.35 %
Deviation from the nominal module temperature	-3,113.11	kWh	-7.15 %
Diodes	-52.42	kWh	-0.13 %
Mismatch (Manufacturer Information)	0.00	kWh	0.00 %
Mismatch (Configuration/Shading)	0.00	kWh	0.00 %
PV Energy (DC) without inverter regulation	**40,348.6**	**kWh**	
Regulation on account of the MPP Voltage Range	-237.17	kWh	-0.59 %
Regulation on account of the max. DC Current	0.00	kWh	0.00 %
Regulation on account of the max. DC Power	0.00	kWh	0.00 %
Regulation on account of the max. AC Power/cos phi	0.00	kWh	0.00 %
MPP Matching	-144.01	kWh	-0.36 %
PV energy (DC)	**39,967.4**	**kWh**	
Energy at the Inverter Input	**39,967.4**	**kWh**	
Input voltage deviates from rated voltage	-7.45	kWh	-0.02 %
DC/AC Conversion	-3,650.01	kWh	-9.13 %
Stand-by Consumption	-18.70	kWh	-0.05 %
Total Cable Losses	0.00	kWh	0.00 %
PV energy (AC) minus standby use	**36,291.3**	**kWh**	
Grid Feed-in	**36,310.0**	**kWh**	

Financial Analysis

System Data

Grid Feed-in in the first year (incl. module degradation)	36,310	kWh/year
PV Generator Output	28	kWp
Start of Operation of the System	1/1/2015	
Assessment Period	20	Years

Economic Parameters

Return on Assets	3.55	%
Accrued Cash Flow (Cash Balance)	13,996.14	$
Amortization Period	15.8	Years
Electricity Production Costs	0.06	$/kWh

Payment Overview

Specific Investment Costs	1,500.00	$/kWp
Investment Costs	42,000.00	$
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	$

California feed-in tariff program - 20 year term - All

Validity	8/5/2016 -	8/4/2036
Specific feed-in / export Remuneration	0.0895	$/kWh
Feed-in / Export Tariff	3,249.74	$/year

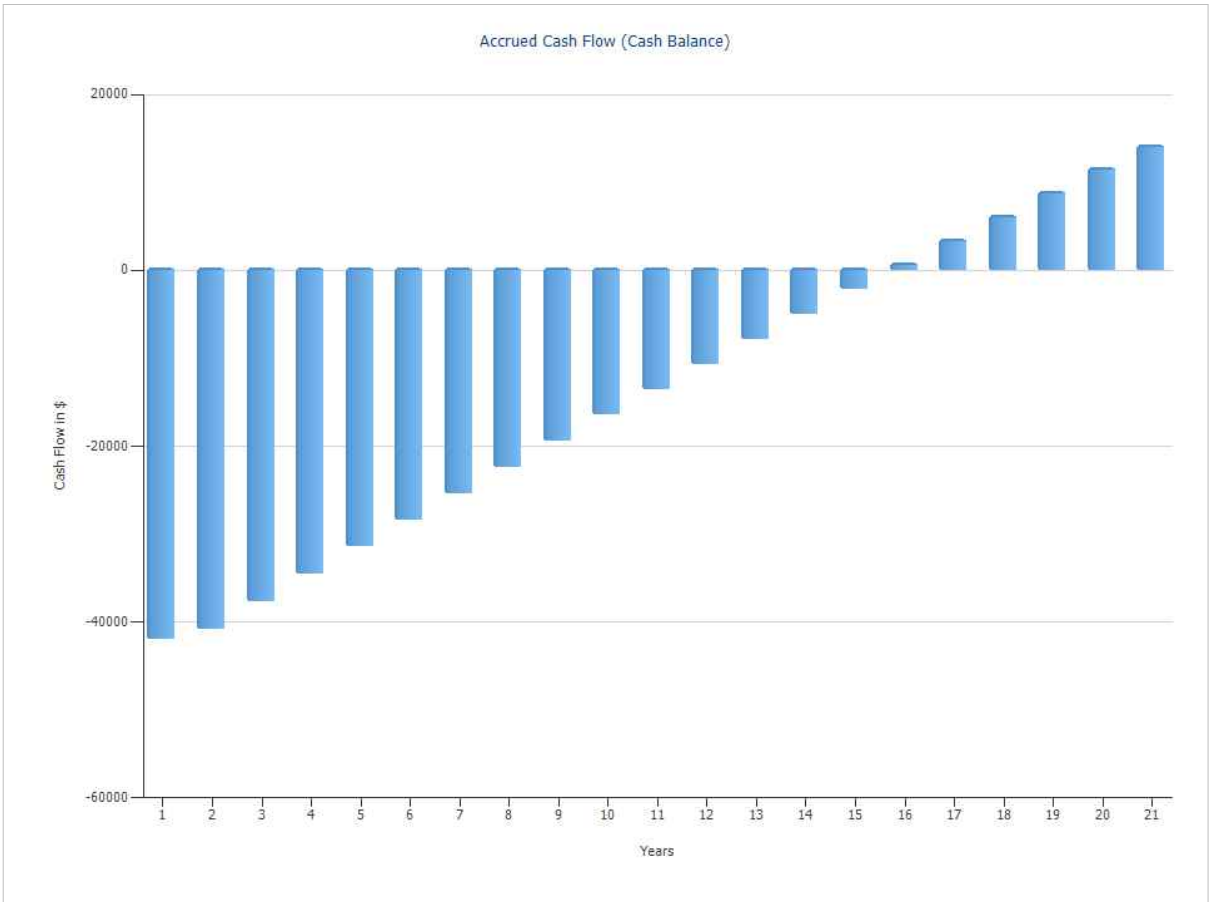


Figure: Accrued Cash Flow (Cash Balance)

Cashflow Table

	year 1	year 2	year 3	year 4	year 5
Investments	($42,000.00)	$0.00	$0.00	$0.00	$0.00
Feed-in / Export Tariff	$0.00	$1,119.08	$3,154.17	$3,122.94	$3,092.02
Annual Cash Flow	**($42,000.00)**	**$1,119.08**	**$3,154.17**	**$3,122.94**	**$3,092.02**
Accrued Cash Flow (Cash Balance)	($42,000.00)	($40,880.92)	($37,726.75)	($34,603.81)	($31,511.80)

	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	$3,061.40	$3,031.09	$3,001.08	$2,971.37	$2,941.95
Annual Cash Flow	**$3,061.40**	**$3,031.09**	**$3,001.08**	**$2,971.37**	**$2,941.95**
Accrued Cash Flow (Cash Balance)	($28,450.39)	($25,419.30)	($22,418.22)	($19,446.85)	($16,504.90)

	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	$2,912.82	$2,883.98	$2,855.43	$2,827.16	$2,799.16
Annual Cash Flow	**$2,912.82**	**$2,883.98**	**$2,855.43**	**$2,827.16**	**$2,799.16**
Accrued Cash Flow (Cash Balance)	($13,592.08)	($10,708.10)	($7,852.67)	($5,025.51)	($2,226.35)

	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	$2,771.45	$2,744.01	$2,716.84	$2,689.94	$2,663.31
Annual Cash Flow	**$2,771.45**	**$2,744.01**	**$2,716.84**	**$2,689.94**	**$2,663.31**
Accrued Cash Flow (Cash Balance)	$545.10	$3,289.11	$6,005.95	$8,695.89	$11,359.20

	year 21
Investments	$0.00
Feed-in / Export Tariff	$2,636.94
Annual Cash Flow	**$2,636.94**
Accrued Cash Flow (Cash Balance)	$13,996.14

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

PV Module: Babbitt

Manufacturer	NREL	
Available	Yes	

Electrical Data

Cell Type	Si polycrystalline	
Only Transformer Inverters suitable	No	
Number of Cells	60	
Number of Bypass Diodes	3	

Mechanical Data

Width	1089	mm
Height	1560	mm
Depth	38	mm
Frame Width	0	mm
Weight	22	kg
Framed	No	

I/V Characteristics at STC

MPP Voltage	28.3	V
MPP Current	7.07	A
Power Rating	200	W
Open Circuit Voltage	36.1	V
Short-Circuit Current	7.7	A
Increase open circuit voltage before stabilisation	0	%

I/V Part Load Characteristics (calculated)

Values source	Standard (Two-diode Model)	
Series resistance Rs	7.51e-03	Ω
Parallel Resistance Rp	1.802	Ω
Saturation Current Parameters Cs1	195.8	A/K³
Saturation Current Parameters Cs2	-1.459e-13	A/K^(2,5)
Photocurrent Parameters C1	6.957e-03	m²/V
Photocurrent Parameters C2	2.6e-06	m²/V
Photocurrent	7.732	A

Further

Voltage Coefficient	-123	mV/K
Electricity Coefficient	2.6	mA/K
Output Coefficient	-0.4	%/K
Incident Angle Modifier	95	%
Maximum System Voltage	1000	V
Spec. Heat Capacity	920	J/(kg*K)
Absorption Coefficient	70	%
Emissions Coefficient	85	%

Inverter: INV250-45US

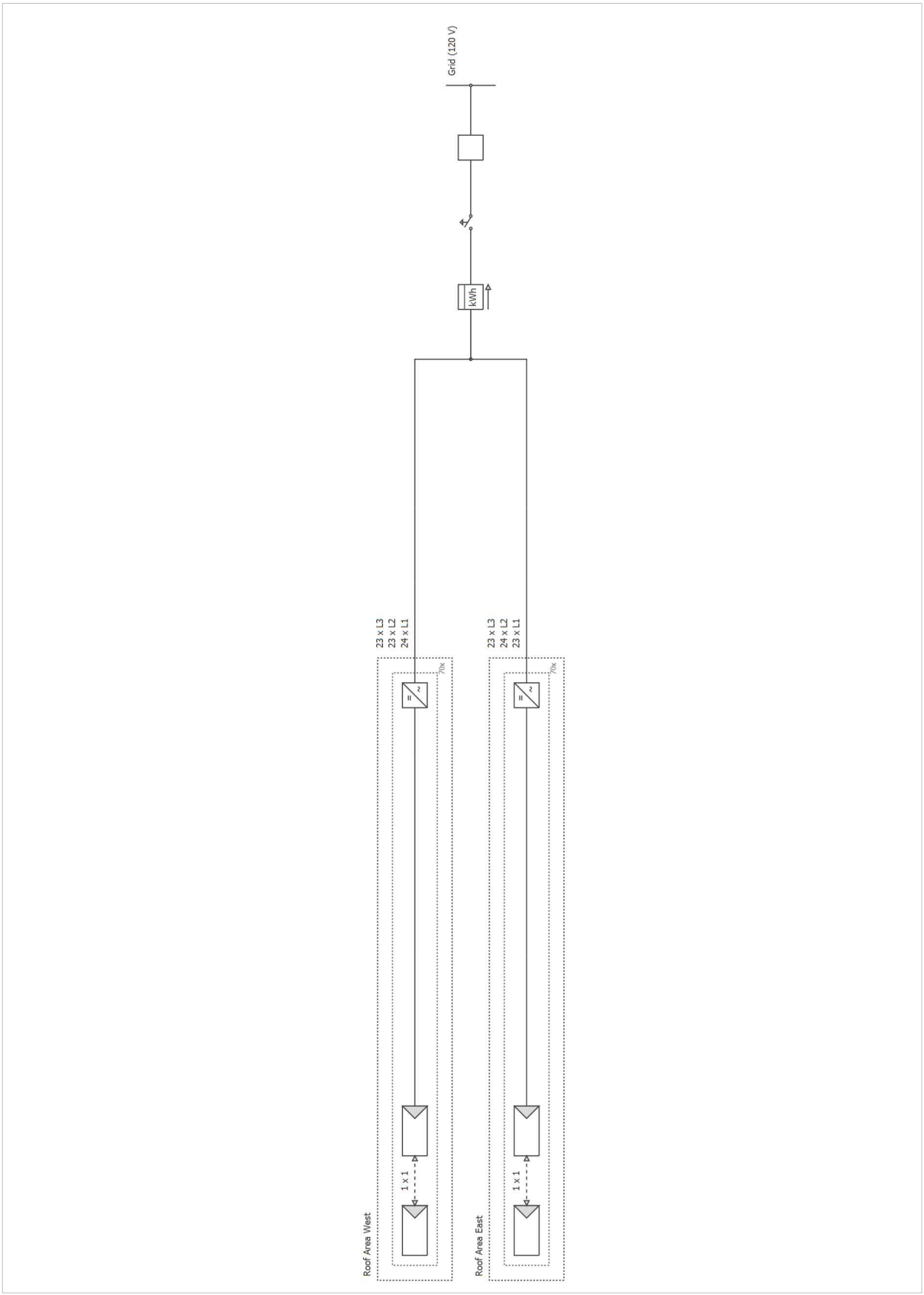
Manufacturer	AEconversion GmbH	
Available	Yes	

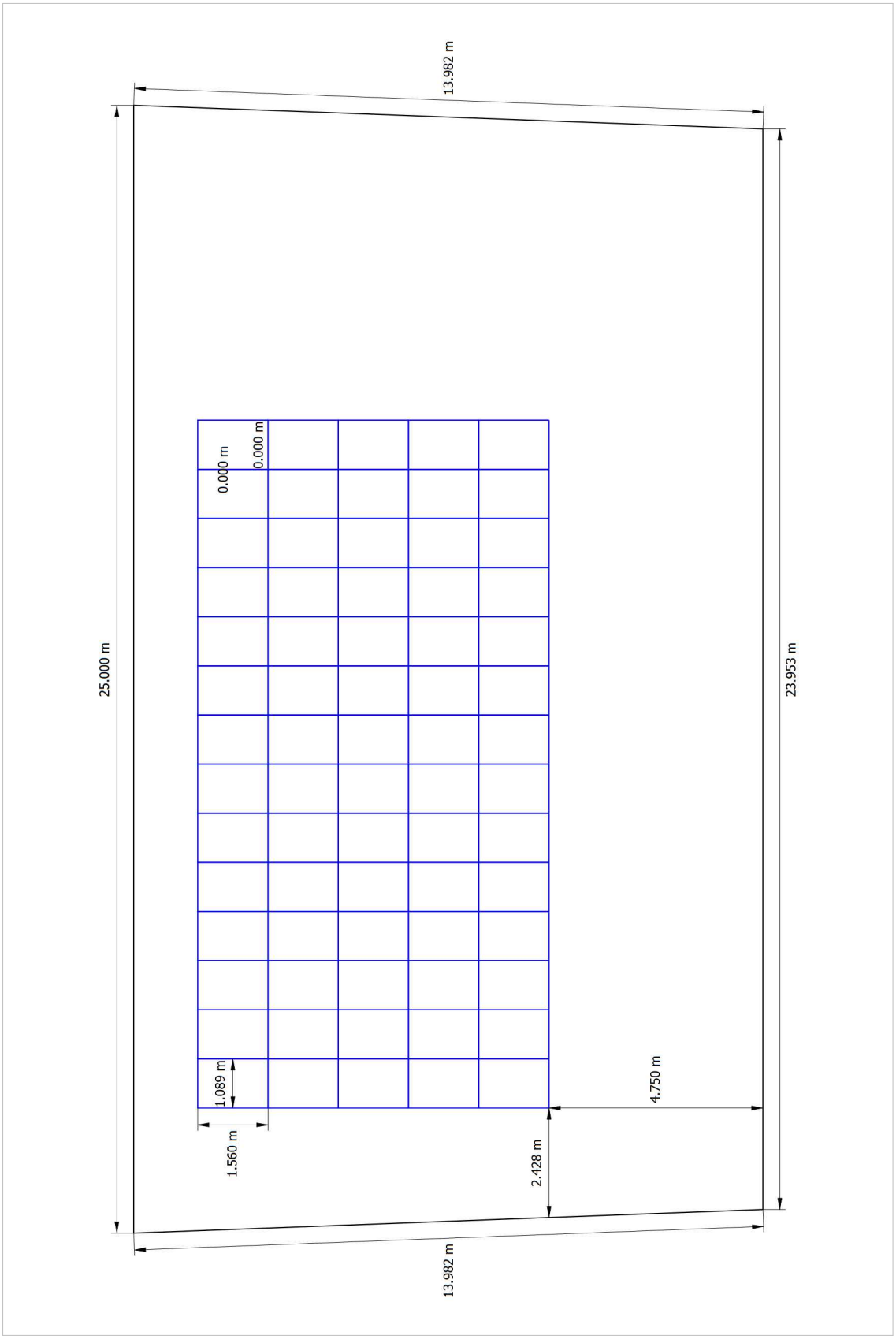
Electrical Data

DC Power Rating	0.25	kW
AC Power Rating	0.24	kW
Max. DC Power	0.26	kW
Max. AC Power	0.24	kW
Stand-by Consumption	0.03	W
Night Consumption	0.03	W
Feed-in from	3	W
Max. Input Current	11	A
Max. Input Voltage	60	V
Nom. DC Voltage	30	V
Number of Feed-in Phases	1	
Number of DC Inlets	1	
With Transformer	Yes	
Change in Efficiency when Input Voltage deviates from Rated Voltage	0.5	%/100V

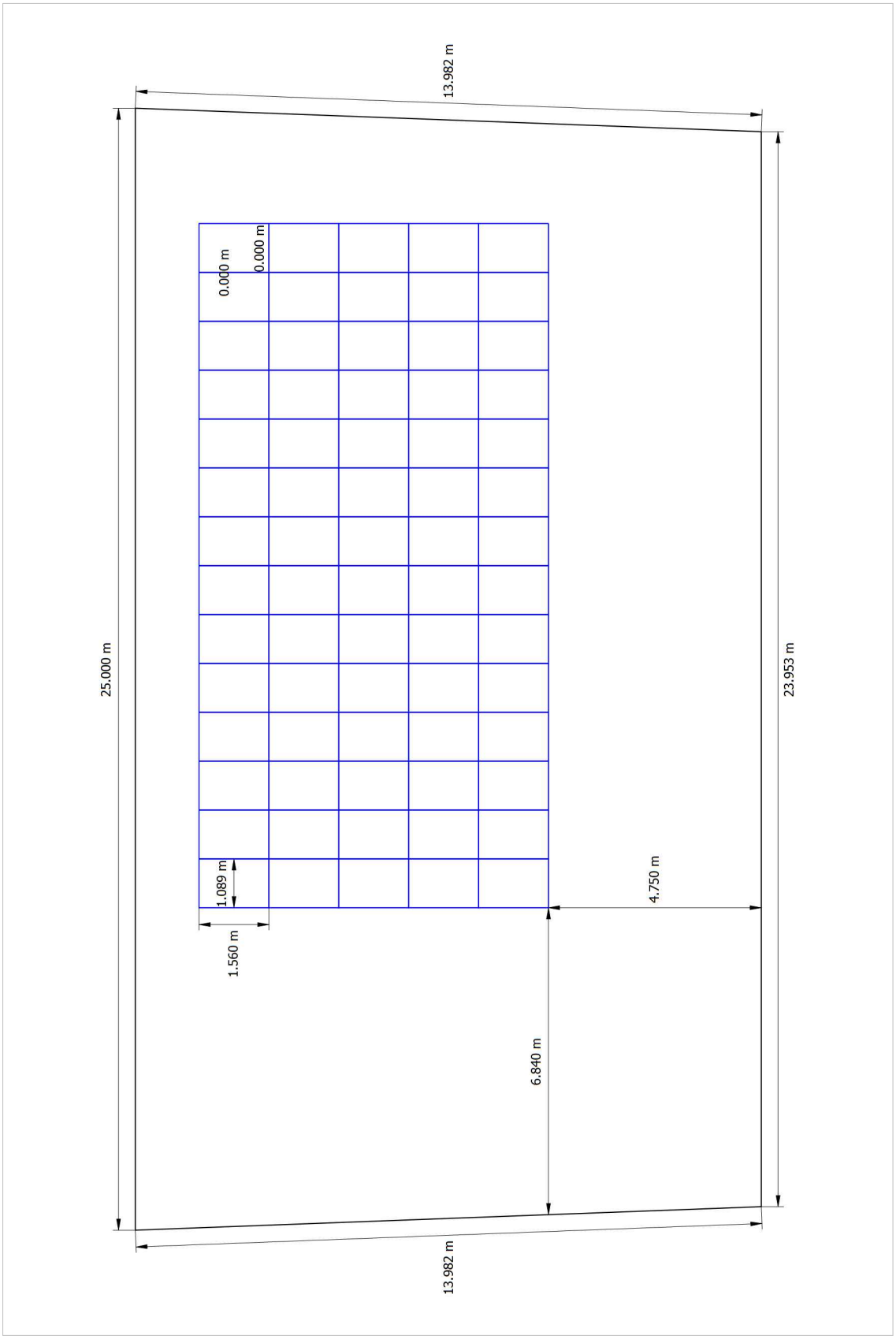
MPP Tracker

Output Range < 20% of Power Rating	99.98	%
Output Range > 20% of Power Rating	99.6	%
No. of MPP Trackers	1	
Max. Input Current per MPP Tracker	11	A
Max. Input Power per MPP Tracker	0.25	kW
Min. MPP Voltage	20	V
Max. MPP Voltage	45	V


Grid (120 V)
kWh
23 x L3
23 x L2
24 x L1
70x
1 x 1
Roof Area West
23 x L3
24 x L2
23 x L1
70x
1 x 1
Roof Area East



Roof Area West



Roof Area East