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TSAM HINO PROJECT
Thami Jili

Project Name: HINO PLANT PV SYSTEM DESIGN

29/05/2024

Your PV system from Sizundawo Engineering(Pty) Ltd

Address of Installation

TSAM HINO



Project Description:
PV SOLAR DESIGN

Project Overview



Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances

Climate Data	Durban, ZAF (2001 - 2020)
Values source	Meteonorm 8.2
PV Generator Output	1127.91 kWp
PV Generator Surface	5,418.5 m ²
Number of PV Modules	2261
Number of Inverters	10

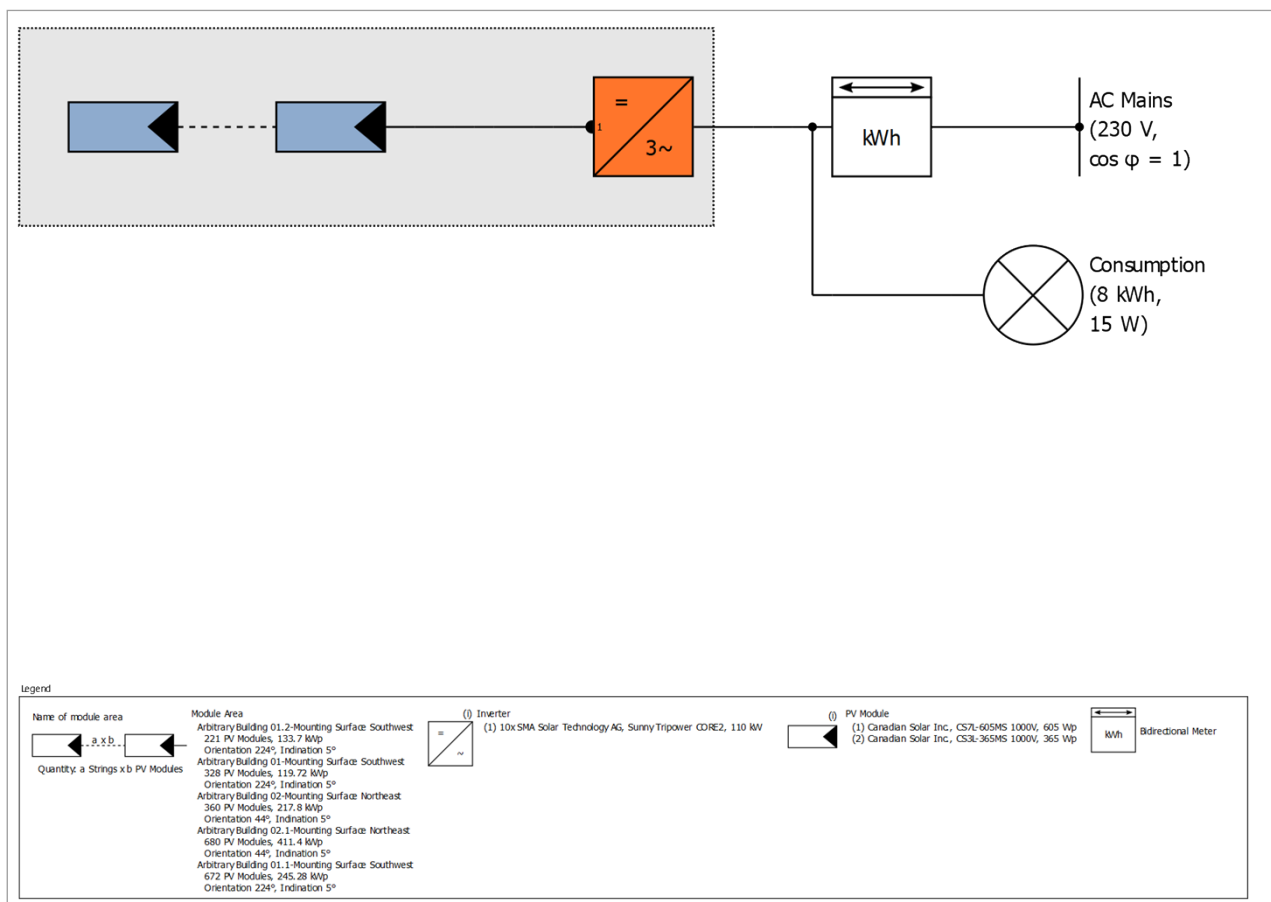


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	1,127.91 kWp
Spec. Annual Yield	1,566.46 kWh/kWp
Performance Ratio (PR)	90.60 %
Yield Reduction due to Shading	0.4 %
PV Generator Energy (AC grid)	1,767,037 kWh/Year
Own Consumption	0 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	1,767,036 kWh/Year
Own Power Consumption	0.0 %
CO ₂ Emissions avoided	830,403 kg / year
Level of Self-sufficiency	0.3 %

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
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Climate Data

Location	Durban, ZAF (2001 - 2020)
Values source	Meteonorm 8.2
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Consumption

Total Consumption	8 kWh
Energy saving bulb (bright room); occasional use	8 kWh
Load Peak	0 kW

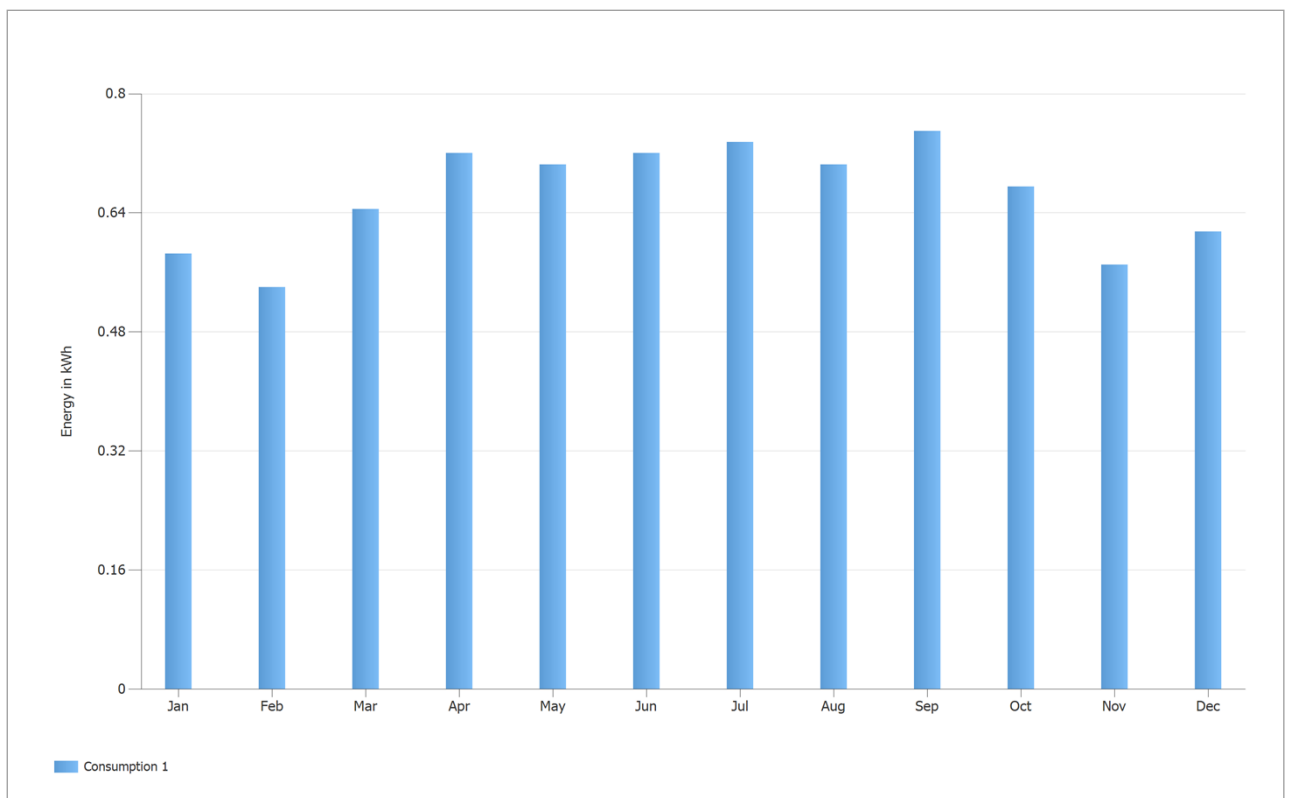


Figure: Consumption

Module Areas

1. Module Area - Arbitrary Building 01.2-Mounting Surface Southwest

PV Generator, 1. Module Area - Arbitrary Building 01.2-Mounting Surface Southwest

Name	Arbitrary Building 01.2-Mounting Surface Southwest
PV Modules	221 x CS7L-605MS 1000V (v2)
Manufacturer	Canadian Solar Inc.
Inclination	5 °
Orientation	Southwest 224 °
Installation Type	Mounted - Roof
PV Generator Surface	625.5 m ²

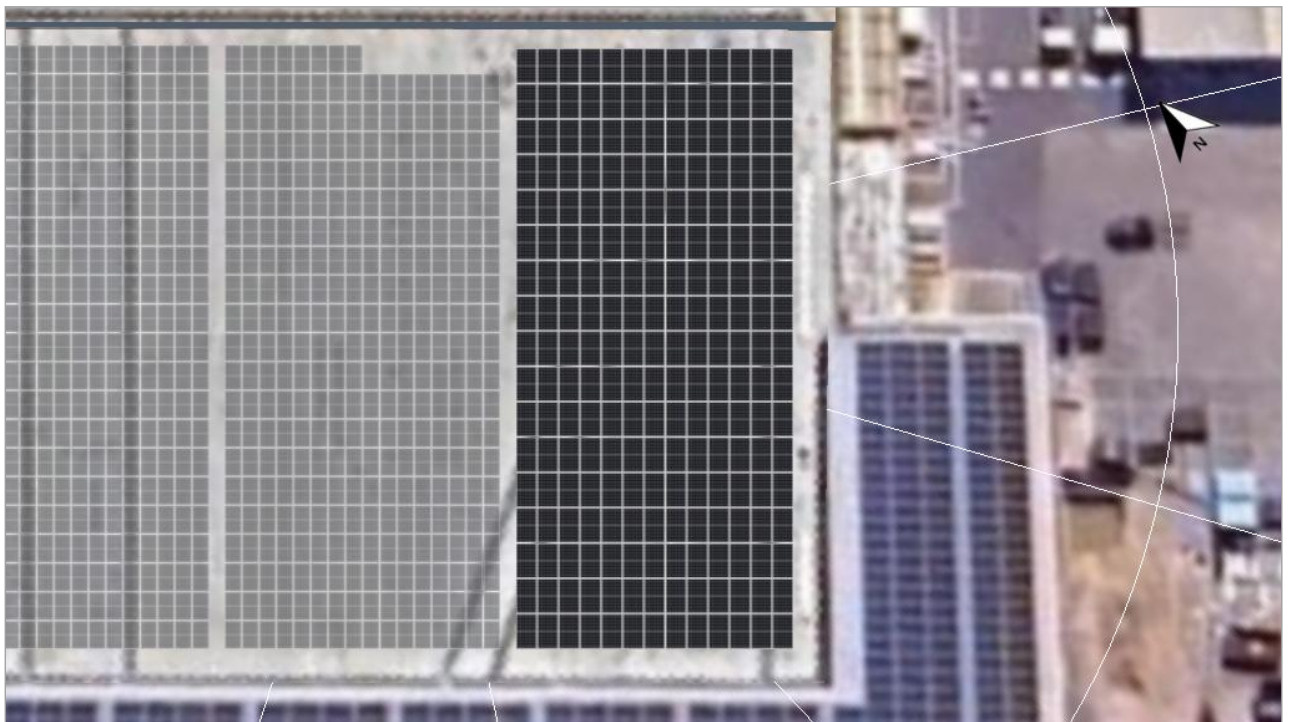


Figure: 1. Module Area - Arbitrary Building 01.2-Mounting Surface Southwest

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

PV Generator, 2. Module Area - Arbitrary Building 01-Mounting Surface Southwest

Name	Arbitrary Building 01-Mounting Surface Southwest
PV Modules	328 x CS3L-365MS 1000V (v2)
Manufacturer	Canadian Solar Inc.
Inclination	5 °
Orientation	Southwest 224 °
Installation Type	Mounted - Roof
PV Generator Surface	606.7 m ²

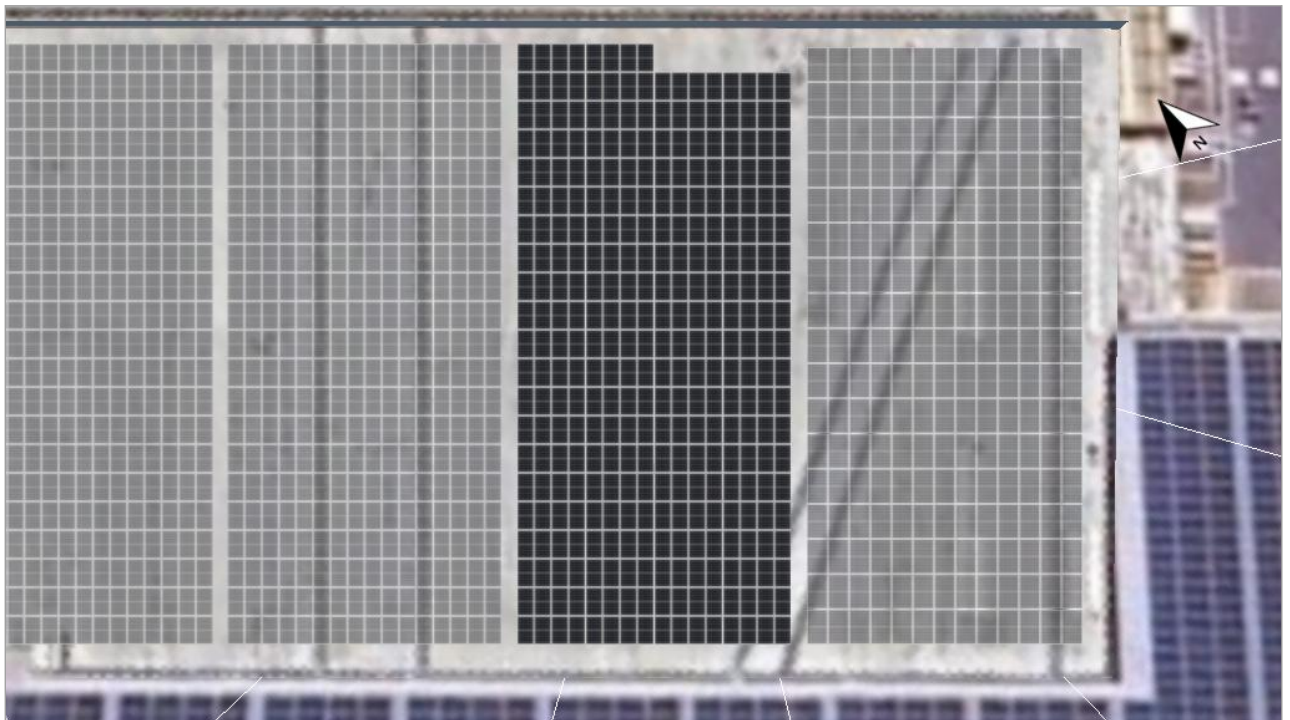


Figure: 2. Module Area - Arbitrary Building 01-Mounting Surface Southwest

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

PV Generator, 3. Module Area - Arbitrary Building 02-Mounting Surface Northeast

Name	Arbitrary Building 02-Mounting Surface Northeast
PV Modules	360 x CS7L-605MS 1000V (v2)
Manufacturer	Canadian Solar Inc.
Inclination	5 °
Orientation	Northeast 44 °
Installation Type	Mounted - Roof
PV Generator Surface	1,018.8 m ²

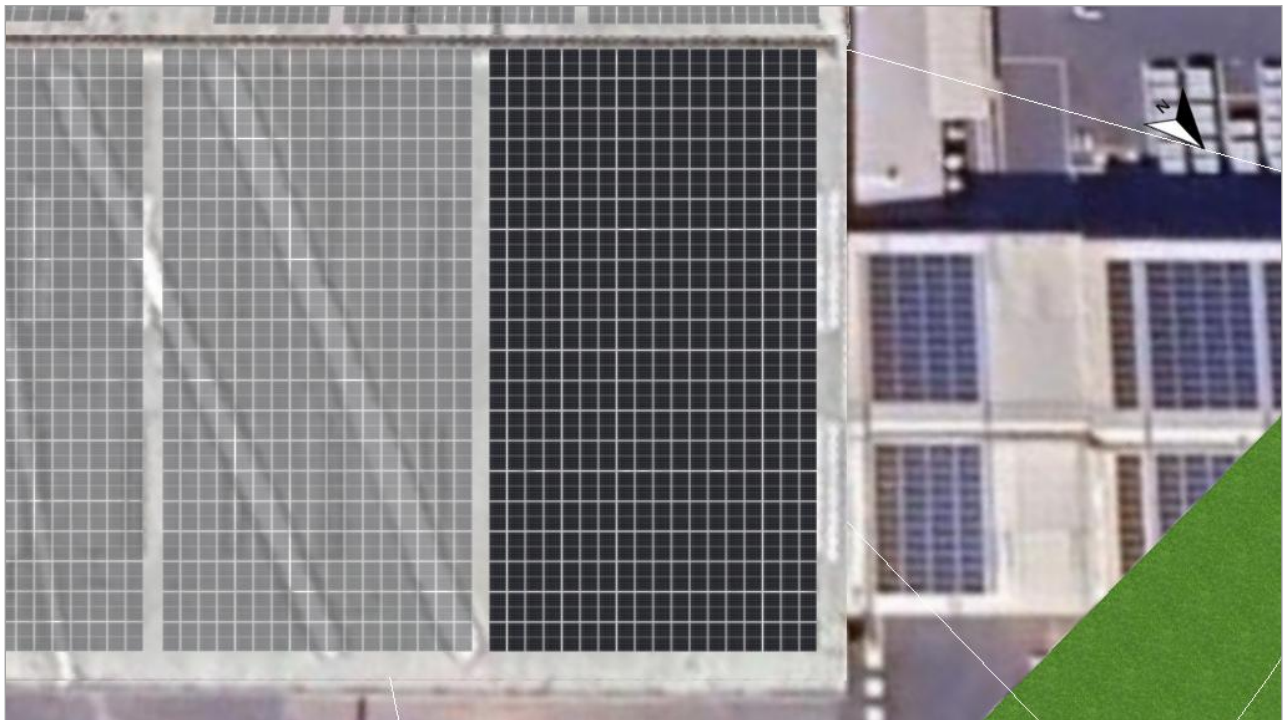


Figure: 3. Module Area - Arbitrary Building 02-Mounting Surface Northeast

4. Module Area - Arbitrary Building 02.1-Mounting Surface Northeast

PV Generator, 4. Module Area - Arbitrary Building 02.1-Mounting Surface Northeast

Name	Arbitrary Building 02.1-Mounting Surface Northeast
PV Modules	680 x CS7L-605MS 1000V (v2)
Manufacturer	Canadian Solar Inc.
Inclination	5 °
Orientation	Northeast 44 °
Installation Type	Roof parallel
PV Generator Surface	1,924.5 m ²

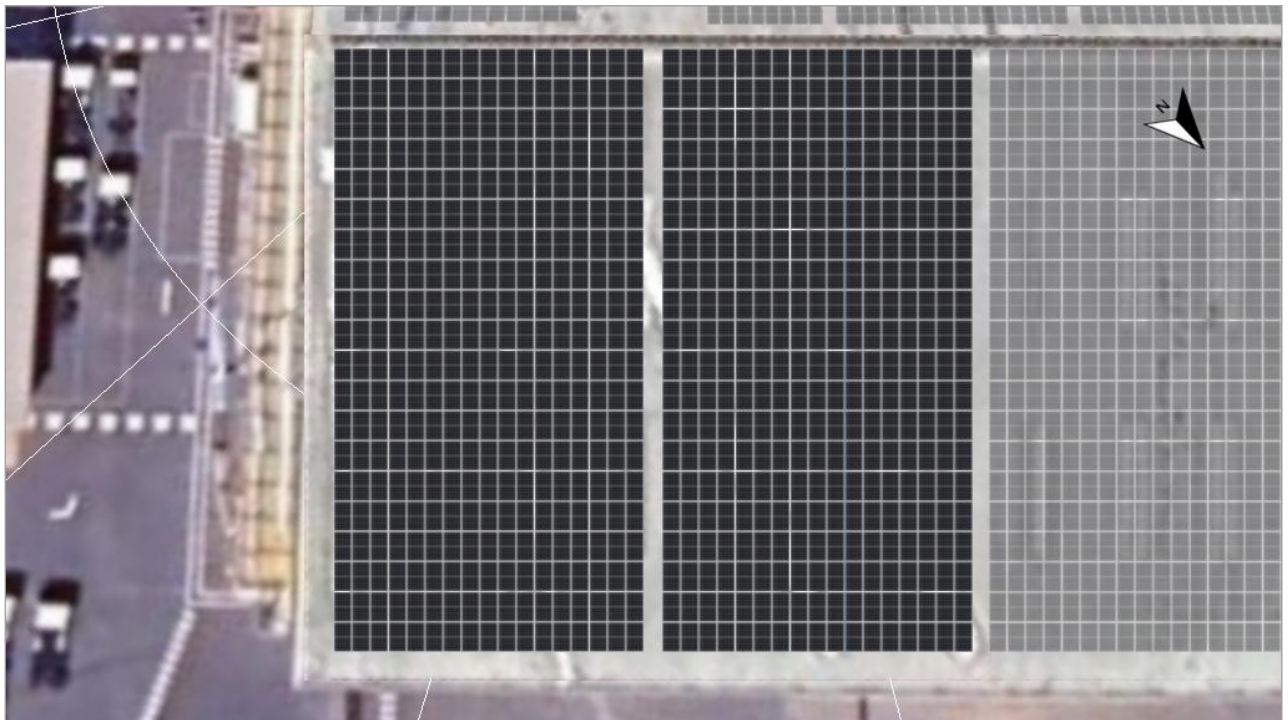


Figure: 4. Module Area - Arbitrary Building 02.1-Mounting Surface Northeast

5. Module Area - Arbitrary Building 01.1-Mounting Surface Southwest

PV Generator, 5. Module Area - Arbitrary Building 01.1-Mounting Surface Southwest

Name	Arbitrary Building 01.1-Mounting Surface Southwest
PV Modules	672 x CS3L-365MS 1000V (v2)
Manufacturer	Canadian Solar Inc.
Inclination	5 °
Orientation	Southwest 224 °
Installation Type	Roof parallel
PV Generator Surface	1,243.0 m²

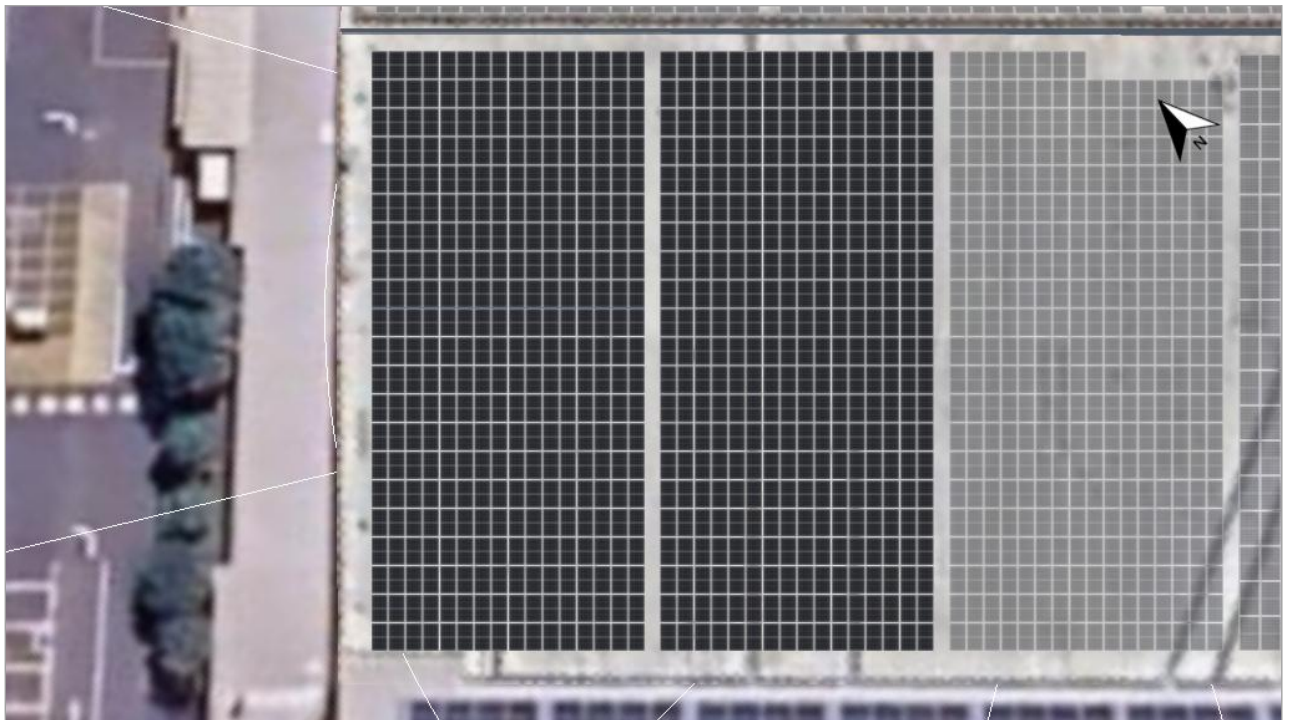


Figure: 5. Module Area - Arbitrary Building 01.1-Mounting Surface Southwest

Horizon Line, 3D Design

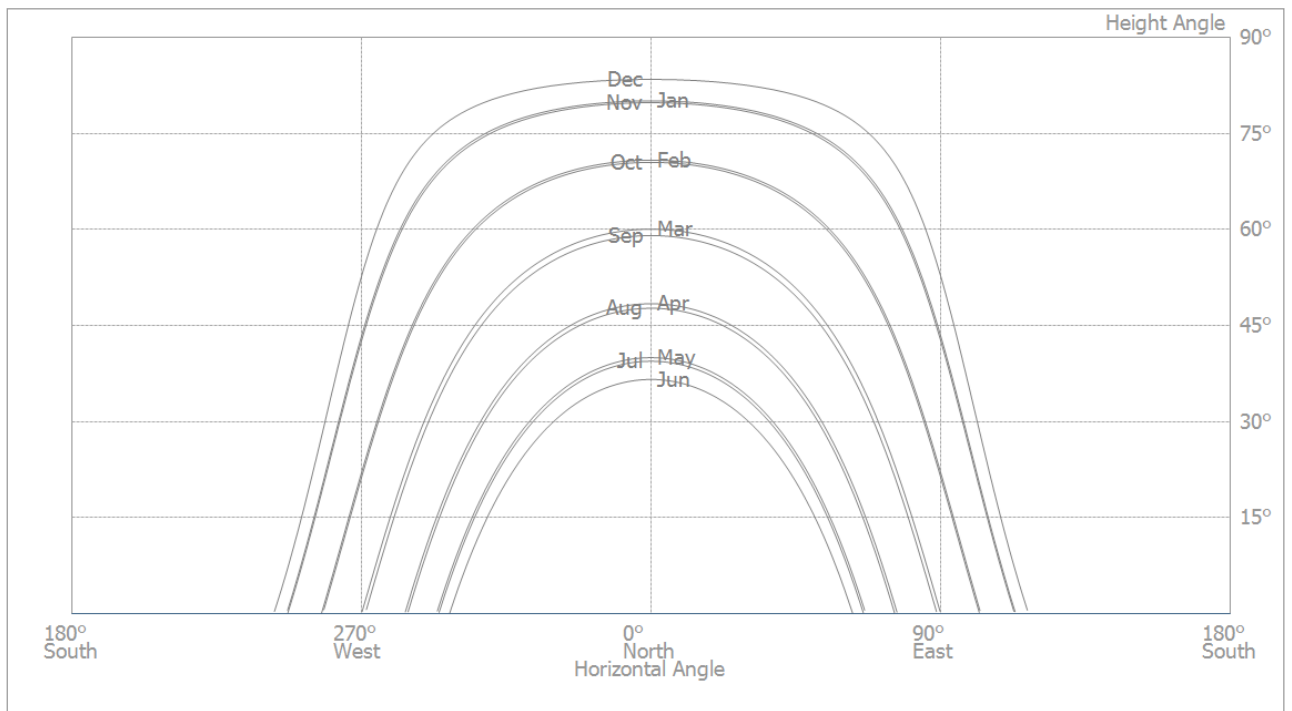


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Areas	Arbitrary Building 01.2-Mounting Surface Southwest + Arbitrary Building 01-Mounting Surface Southwest + Arbitrary Building 02-Mounting Surface Northeast + Arbitrary Building 02.1-Mounting Surface Northeast + Arbitrary Building 01.1-Mounting Surface Southwest
Inverter 1	
Model	Sunny Tripower CORE2 (v2)
Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	93.3 %
Configuration	MPP 1: 1 x 20
	MPP 2: 1 x 20
	MPP 3: 1 x 21
	MPP 4: 1 x 20
	MPP 5: 1 x 20
	MPP 6: 1 x 20
	MPP 7: 1 x 20
	MPP 8: 1 x 20
	MPP 9: 1 x 20
	MPP 10: 1 x 20
	MPP 11: 1 x 20
	MPP 12: 1 x 20
Inverter 2	
Model	Sunny Tripower CORE2 (v2)
Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	105.6 %
Configuration	MPP 1: 1 x 16
	MPP 2: 1 x 16
	MPP 3: 1 x 16
	MPP 4: 1 x 16
	MPP 5: 1 x 16
	MPP 6: 1 x 16
	MPP 7: 1 x 16
	MPP 8: 1 x 16
	MPP 9: 1 x 16
	MPP 10: 1 x 16
	MPP 11: 1 x 16
	MPP 12: 1 x 16
Inverter 3	
Model	Sunny Tripower CORE2 (v2)
Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	105.6 %
Configuration	MPP 1: 1 x 17
	MPP 2: 1 x 17
	MPP 3: 1 x 17
	MPP 4: 1 x 17
	MPP 5: 1 x 17
	MPP 6: 1 x 17
	MPP 7: 1 x 15
	MPP 8: 1 x 15
	MPP 9: 1 x 15
	MPP 10: 1 x 15

		MPP 11: 1 x 15
		MPP 12: 1 x 15
Inverter 4		
Model	Sunny Tripower CORE2 (v2)	
Manufacturer	SMA Solar Technology AG	
Quantity	1	
Sizing Factor	96.9 %	
Configuration		MPP 1: 2 x 14
		MPP 2: 2 x 14
		MPP 3: 2 x 14
		MPP 4: 2 x 16
		MPP 5: 2 x 16
		MPP 6: 2 x 14
		MPP 7: 2 x 14
		MPP 8: 2 x 14
		MPP 9: 1 x 15
		MPP 10: 1 x 15
		MPP 11: 1 x 15
		MPP 12: 1 x 15
Inverter 5		
Model	Sunny Tripower CORE2 (v2)	
Manufacturer	SMA Solar Technology AG	
Quantity	1	
Sizing Factor	121 %	
Configuration		MPP 1: 1 x 15
		MPP 2: 1 x 15
		MPP 3: 1 x 15
		MPP 4: 1 x 15
		MPP 5: 1 x 20
		MPP 6: 1 x 20
		MPP 7: 1 x 20
		MPP 8: 1 x 20
		MPP 9: 1 x 20
		MPP 10: 1 x 20
		MPP 11: 1 x 20
		MPP 12: 1 x 20
Inverter 6		
Model	Sunny Tripower CORE2 (v2)	
Manufacturer	SMA Solar Technology AG	
Quantity	1	
Sizing Factor	104.5 %	
Configuration		MPP 1: 1 x 16
		MPP 2: 1 x 16
		MPP 3: 1 x 16
		MPP 4: 1 x 16
		MPP 5: 1 x 16
		MPP 6: 1 x 16
		MPP 7: 1 x 16
		MPP 8: 1 x 16
		MPP 9: 1 x 16
		MPP 10: 1 x 16
		MPP 11: 1 x 15
		MPP 12: 1 x 15

Inverter 7

Model	Sunny Tripower CORE2 (v2)
Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	99 %
Configuration	MPP 1: 1 x 15
	MPP 2: 1 x 15
	MPP 3: 1 x 15
	MPP 4: 1 x 15
	MPP 5: 1 x 15
	MPP 6: 1 x 15
	MPP 7: 1 x 15
	MPP 8: 1 x 15
	MPP 9: 1 x 15
	MPP 10: 1 x 15
	MPP 11: 1 x 15
	MPP 12: 1 x 15

Inverter 8

Model	Sunny Tripower CORE2 (v2)
Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	91.4 %
Configuration	MPP 1: 1 x 16
	MPP 2: 1 x 16
	MPP 3: 1 x 16
	MPP 4: 1 x 17
	MPP 5: 1 x 17
	MPP 6: 1 x 16
	MPP 7: 1 x 16
	MPP 8: 1 x 16
	MPP 9: 1 x 15
	MPP 10: 1 x 15
	MPP 11: 1 x 15
	MPP 12: 1 x 15

Inverter 9

Model	Sunny Tripower CORE2 (v2)
Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	104.7 %
Configuration	MPP 1: 2 x 14
	MPP 2: 2 x 14
	MPP 3: 2 x 14
	MPP 4: 2 x 16
	MPP 5: 2 x 16
	MPP 6: 2 x 14
	MPP 7: 1 x 15
	MPP 8: 1 x 15
	MPP 9: 1 x 16
	MPP 10: 1 x 16
	MPP 11: 1 x 17
	MPP 12: 1 x 17

Inverter 10

Model	Sunny Tripower CORE2 (v2)
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Manufacturer	SMA Solar Technology AG
Quantity	1
Sizing Factor	103.4 %
Configuration	MPP 1: 2 x 14
	MPP 2: 2 x 14
	MPP 3: 2 x 14
	MPP 4: 2 x 16
	MPP 5: 2 x 16
	MPP 6: 2 x 14
	MPP 7: 2 x 14
	MPP 8: 2 x 14
	MPP 9: 1 x 15
	MPP 10: 1 x 15
	MPP 11: 1 x 15
	MPP 12: 1 x 15

AC Mains

AC Mains

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

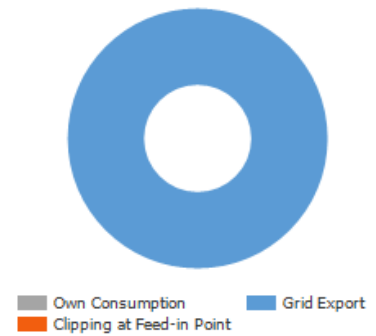
Simulation Results

Results Total System

PV System

PV Generator Output	1,127.91 kWp
Spec. Annual Yield	1,566.46 kWh/kWp
Performance Ratio (PR)	90.60 %
Yield Reduction due to Shading	0.4 %
PV Generator Energy (AC grid)	1,767,037 kWh/Year
Own Consumption	0 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	1,767,036 kWh/Year
Own Power Consumption	0.0 %
CO ₂ Emissions avoided	830,403 kg / year

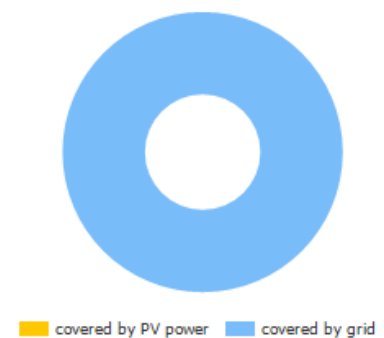
PV Generator Energy (AC grid)



Appliances

Appliances	8 kWh/Year
Standby Consumption (Inverter)	222 kWh/Year
Total Consumption	230 kWh/Year
covered by PV power	0 kWh/Year
covered by grid	229 kWh/Year
Solar Fraction	0.3 %

Total Consumption

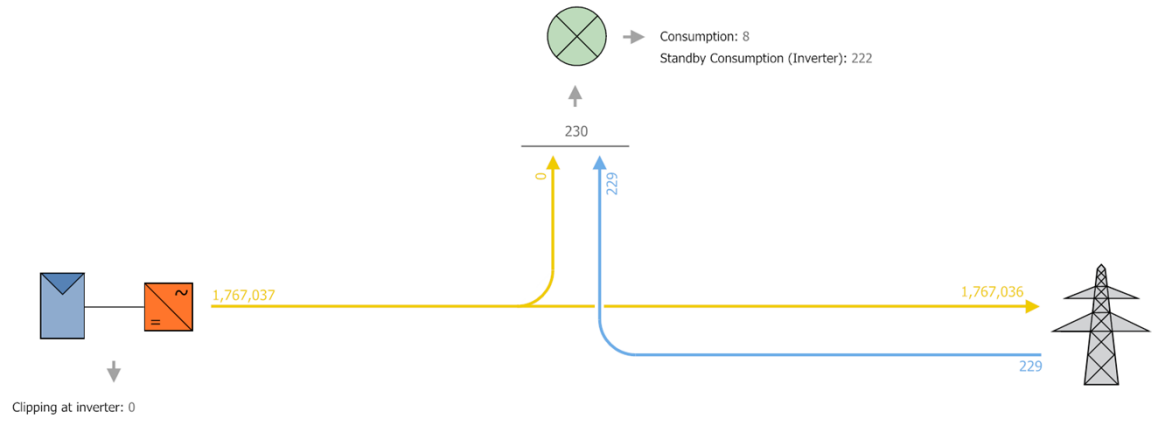


Level of Self-sufficiency

Total Consumption	230 kWh/Year
covered by grid	229 kWh/Year
Level of Self-sufficiency	0.3 %

Energy Flow Graph

Project: HINO PLANT PV SYSTEM DESIGN



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

Figure: Energy flow

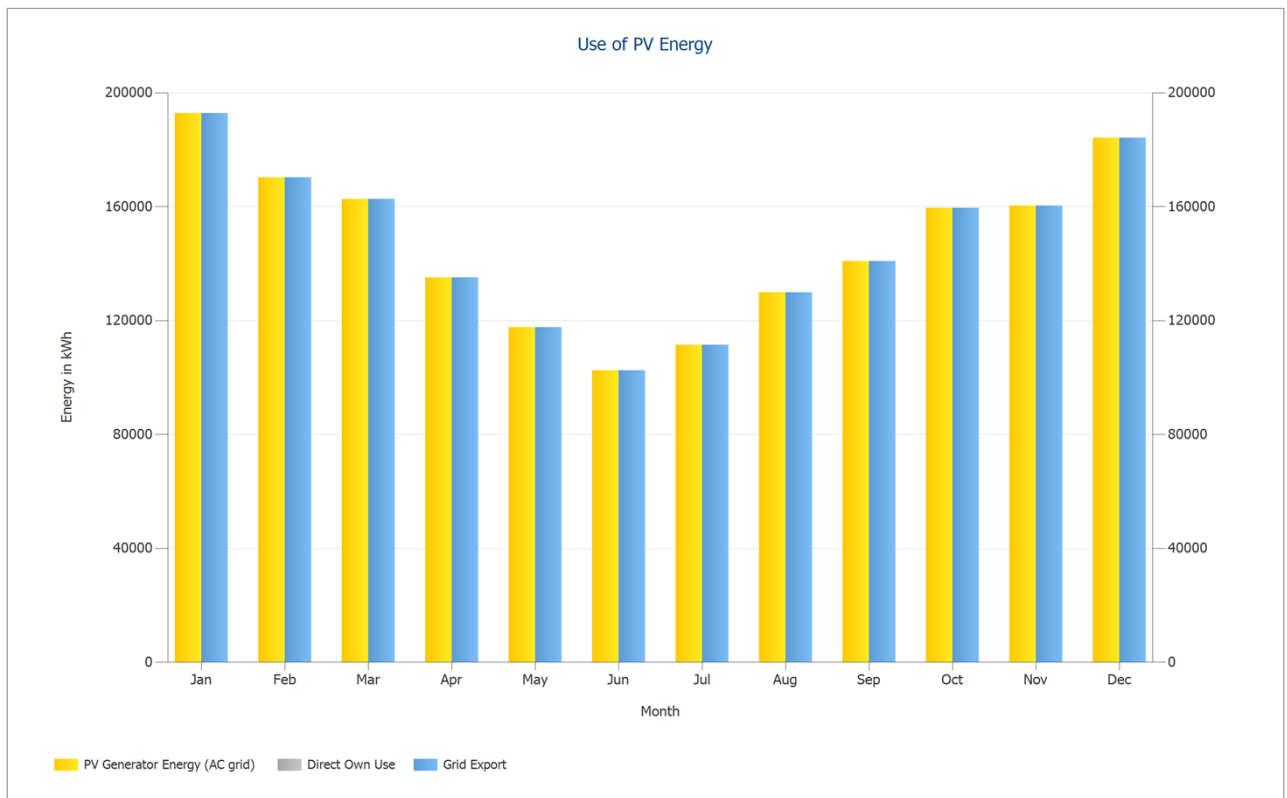


Figure: Use of PV Energy

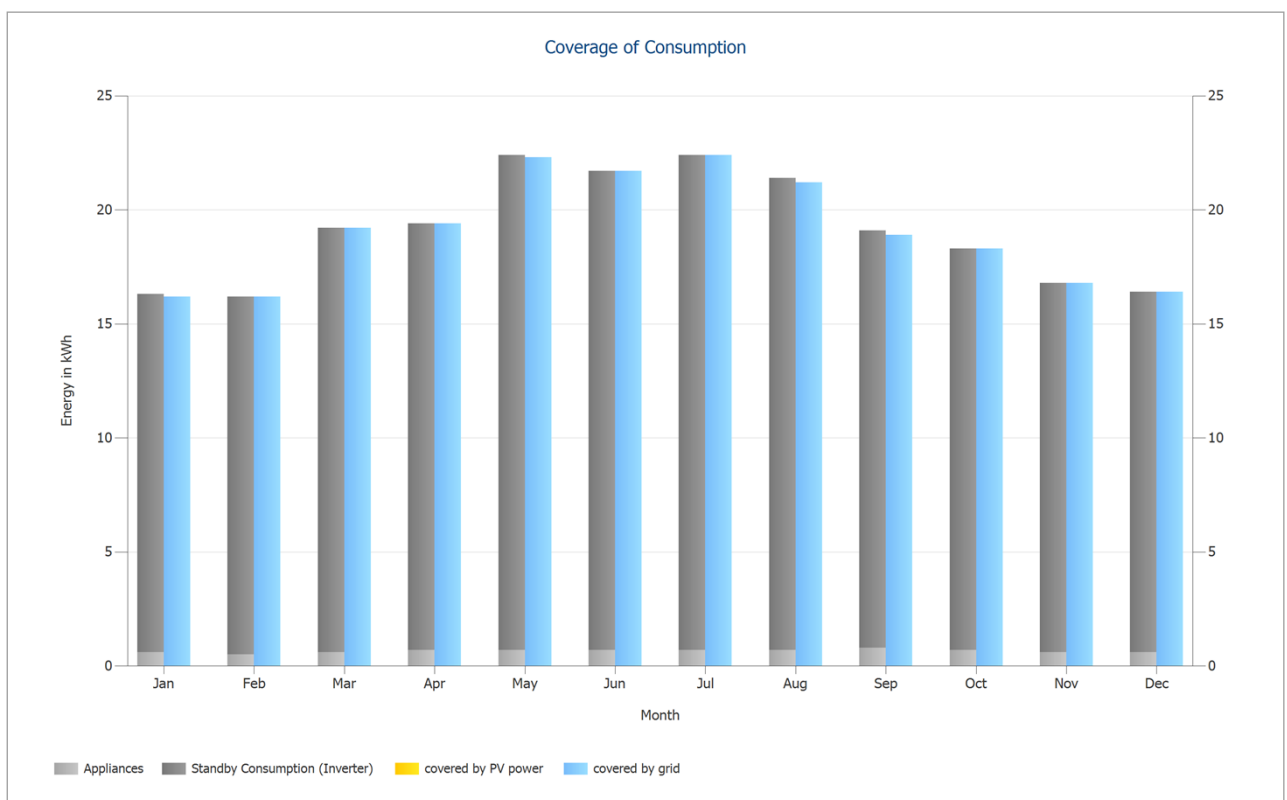


Figure: Coverage of Consumption

PV System Energy Balance

PV System Energy Balance

Global radiation - horizontal	1,746.49 kWh/m²	
Deviation from standard spectrum	-17.46 kWh/m ²	-1.00 %
Ground Reflection (Albedo)	0.66 kWh/m ²	0.04 %
Orientation and inclination of the module surface	-1.57 kWh/m ²	-0.09 %
Module-independent shading	0.00 kWh/m ²	0.00 %
Reflection on the Module Surface	-11.94 kWh/m ²	-0.69 %
Global Radiation at the Module	1,716.17 kWh/m²	
	1,716.17 kWh/m ²	
	x 5418.496 m ²	
	= 9,299,038.27 kWh	
Global PV Radiation	9,299,038.27 kWh	
Soiling	0.00 kWh	0.00 %
STC Conversion (Rated Efficiency of Module 20.84 %)	-7,360,910.10 kWh	-79.16 %
Rated PV Energy	1,938,128.18 kWh	
Module-specific Partial Shading	-5,403.92 kWh	-0.28 %
Low-light performance	10,007.54 kWh	0.52 %
Deviation from the nominal module temperature	-94,845.37 kWh	-4.88 %
Diodes	-155.61 kWh	-0.01 %
Mismatch (Manufacturer Information)	-36,954.62 kWh	-2.00 %
Mismatch (Configuration/Shading)	-2,726.90 kWh	-0.15 %
PV Energy (DC) without inverter clipping	1,808,049.30 kWh	
Failing to reach the DC start output	-90.52 kWh	-0.01 %
Clipping on account of the MPP Voltage Range	-0.07 kWh	0.00 %
Clipping on account of the max. DC Current	0.00 kWh	0.00 %
Clipping on account of the max. DC Power	0.00 kWh	0.00 %
Clipping on account of the max. AC Power/cos phi	-282.35 kWh	-0.02 %
MPP Matching	-3,859.73 kWh	-0.21 %
PV energy (DC)	1,803,816.64 kWh	
Energy at the Inverter Input	1,803,816.64 kWh	
Input voltage deviates from rated voltage	-4,720.36 kWh	-0.26 %
DC/AC Conversion	-32,059.69 kWh	-1.78 %
Standby Consumption (Inverter)	-221.70 kWh	-0.01 %
Total Cable Losses	0.00 kWh	0.00 %
PV energy (AC) minus standby use	1,766,814.88 kWh	
PV Generator Energy (AC grid)	1,767,036.58 kWh	



Plans and parts list

Circuit Diagram

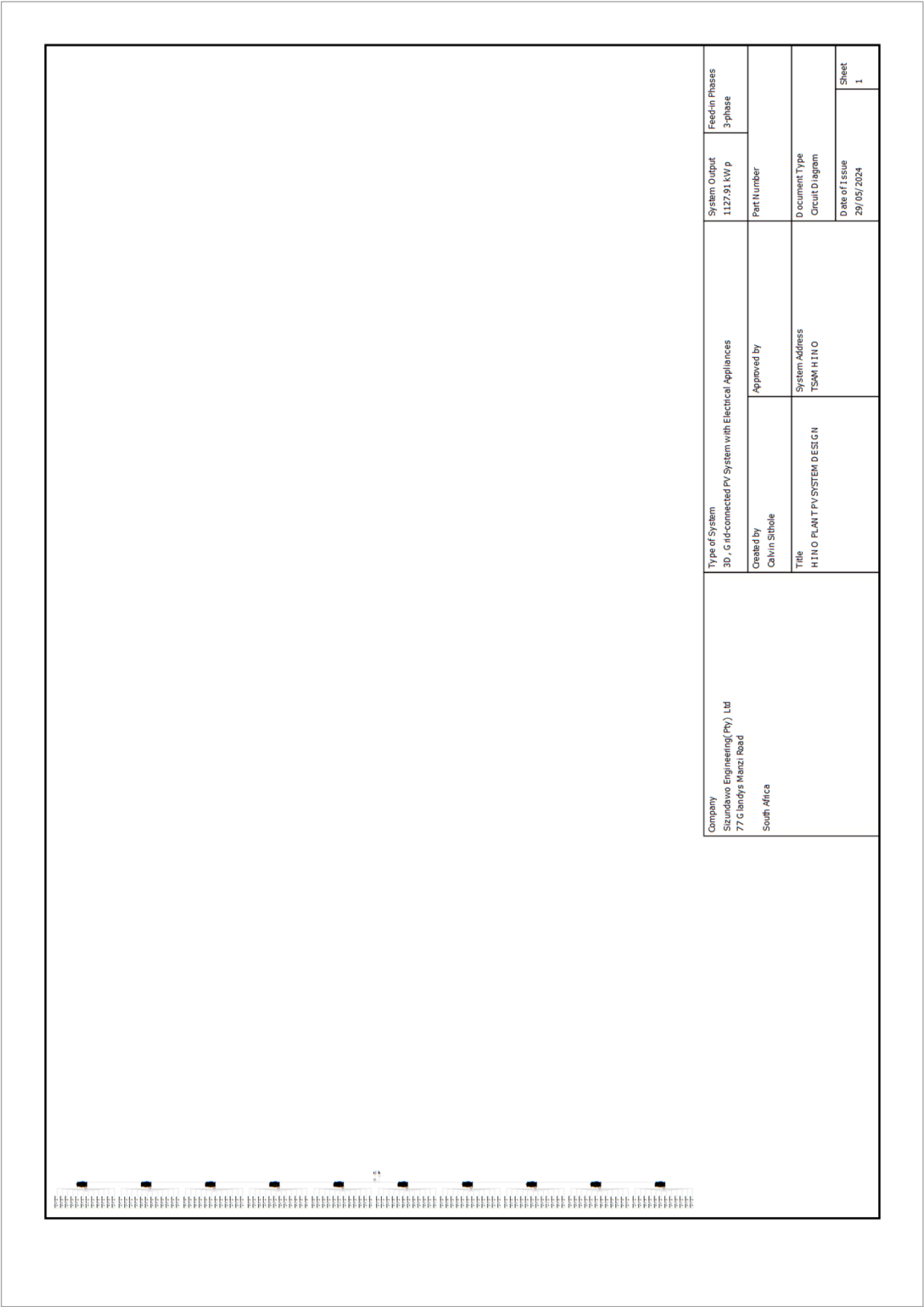


Figure: Circuit Diagram

Overview plan

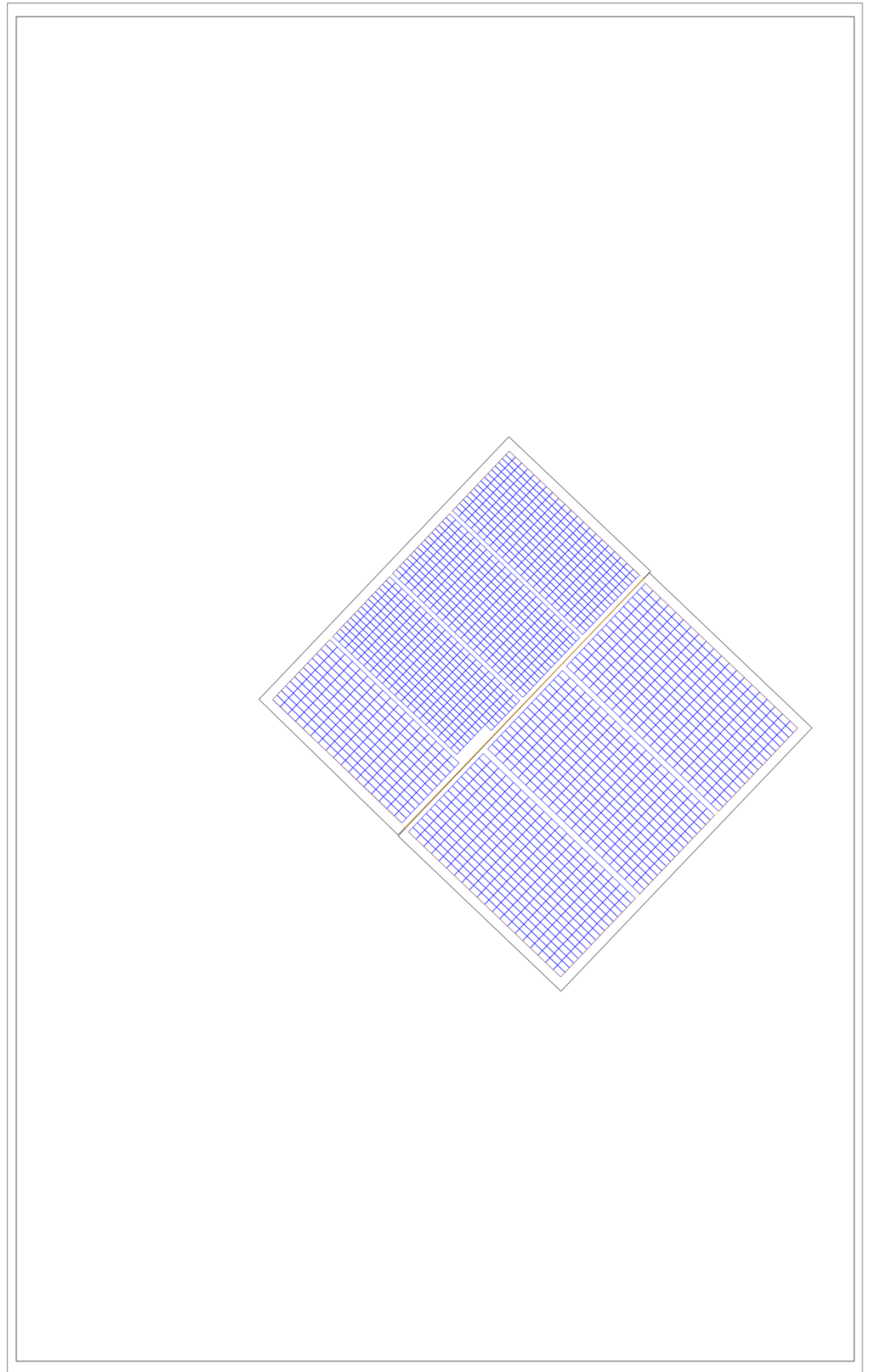
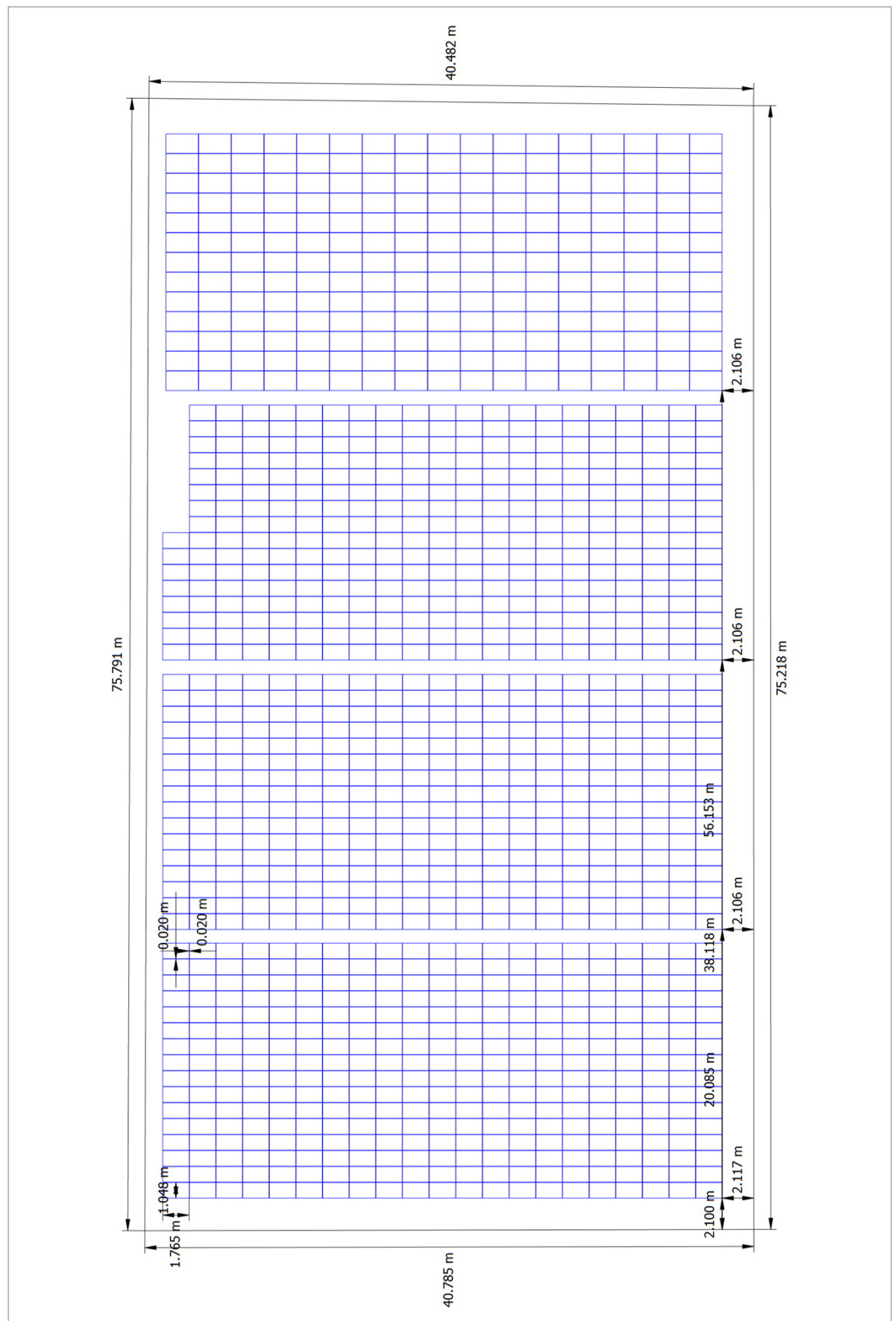


Figure: Overview plan



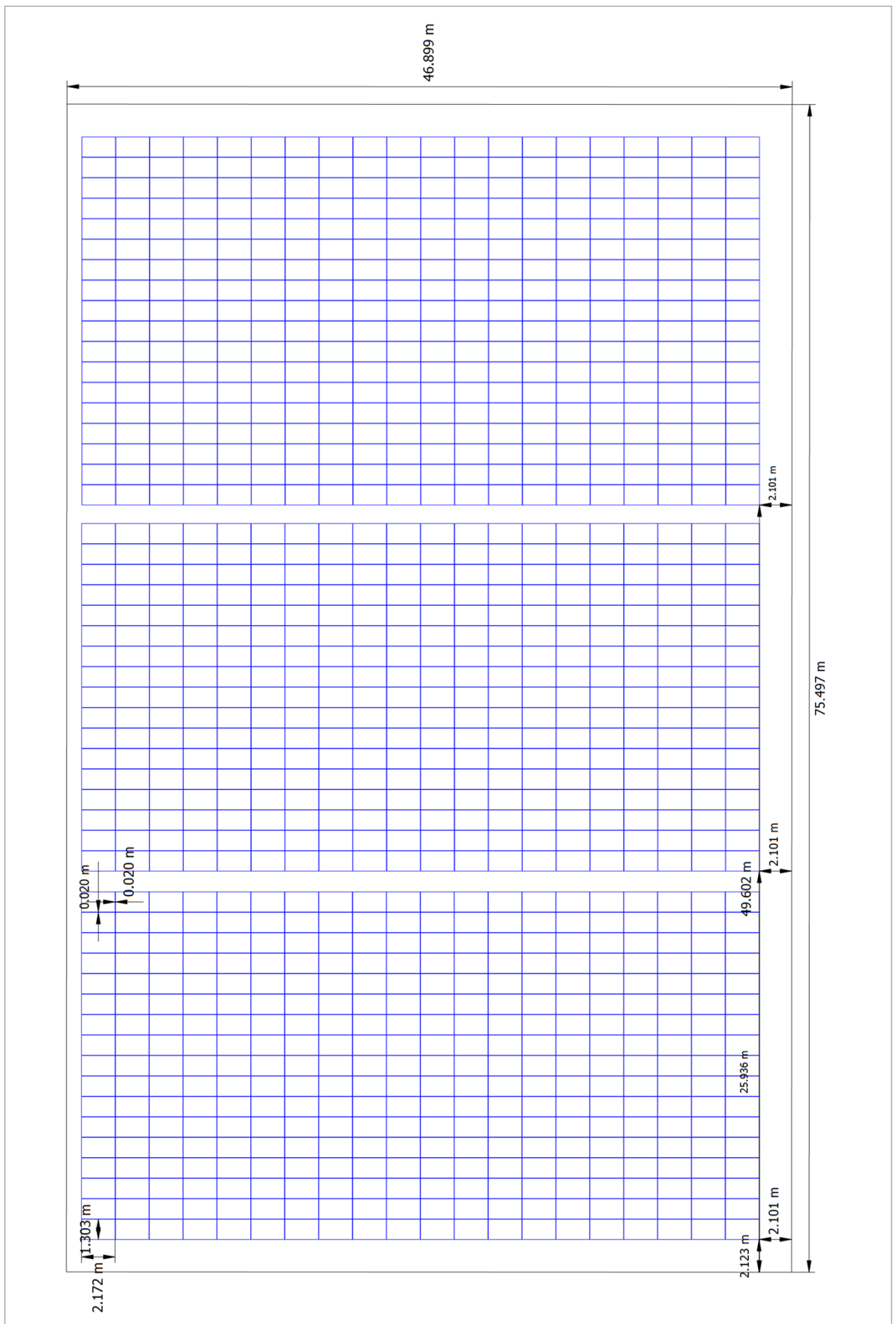


Figure: Arbitrary Building 02 - Mounting Surface Northeast

String Plan

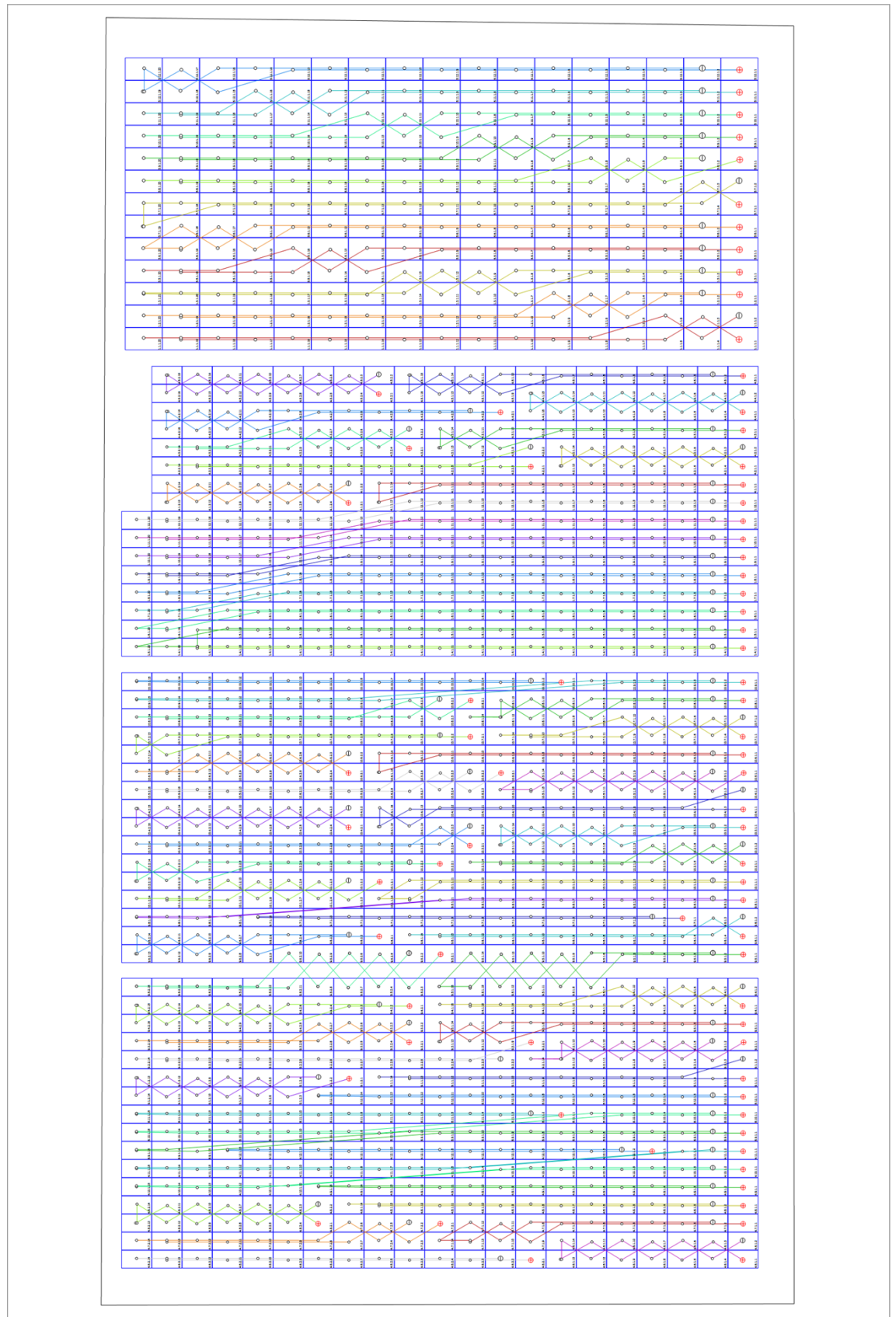


Figure: Arbitrary Building 01 - Mounting Surface Southwest

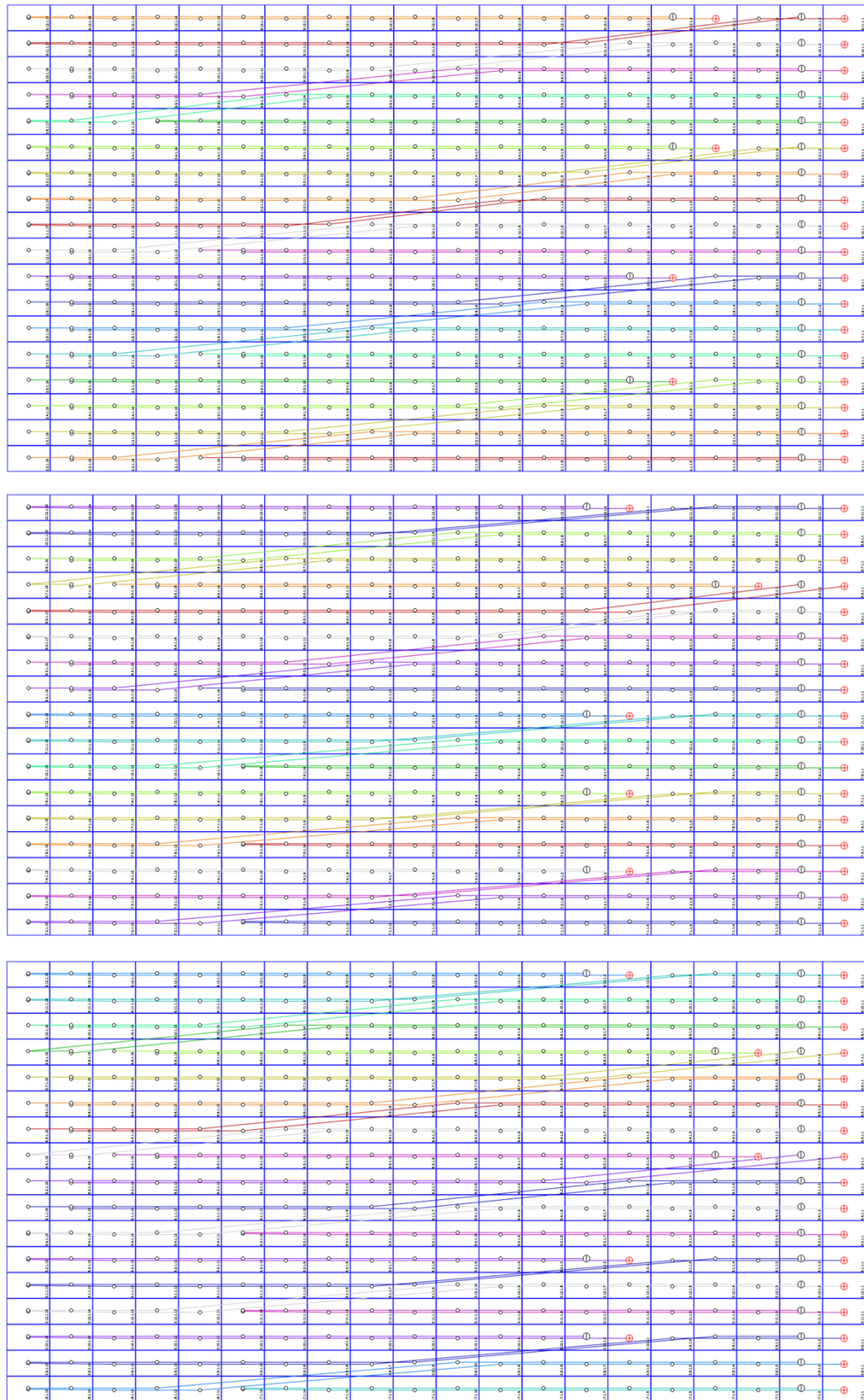


Figure: Arbitrary Building 02 - Mounting Surface Northeast

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		Canadian Solar Inc.	CS7L-605MS 1000V	1261	Piece
2	PV Module		Canadian Solar Inc.	CS3L-365MS 1000V	1000	Piece
3	Inverter		SMA Solar Technology AG	Sunny Tripower CORE2	10	Piece
4	Components			Bidirectional Meter	1	Piece