



Soukr. RD
Tomáš Březina
Vizovická 613
460 08 Liberec XIX- Horní Hanychov

Solar Král s.r.o.
Pod Čertovým pahorkem 471
261 01 Příbram VII
Česká republika

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Customer No.: 2024-321
Project Name: FVE Březina Tomáš Liberec RD613 JA Solar
450 5,4 kWp 10,65 kWh
Offer no.: P2024-322-2

30.09.2024

Your PV system from Solar Král s.r.o.

Address of Installation

Vizovická 613
460 08 Liberec XIX- Horní Hanychov



Project Description:

Panely orientace východ-západ, bifaciální, 90° kolmo
Maximum panelů
Výkon sledovat po hodinách (spotové ceny)



Project Overview

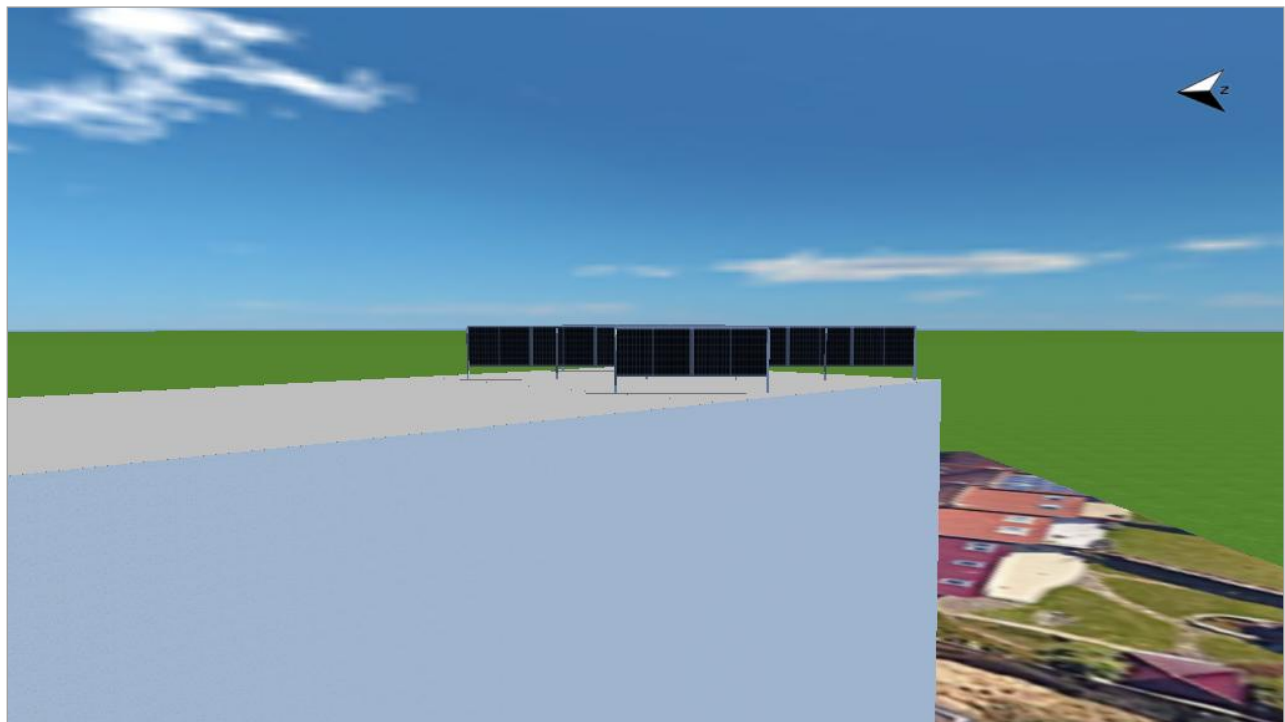


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances and Battery Systems

Climate Data	Liberec, CZE (2001 - 2020)
Values source	Meteonorm 8.2
PV Generator Output	5,4 kWp
PV Generator Surface	24,0 m²
Number of PV Modules	12
Number of Inverters	1
No. of battery systems	1

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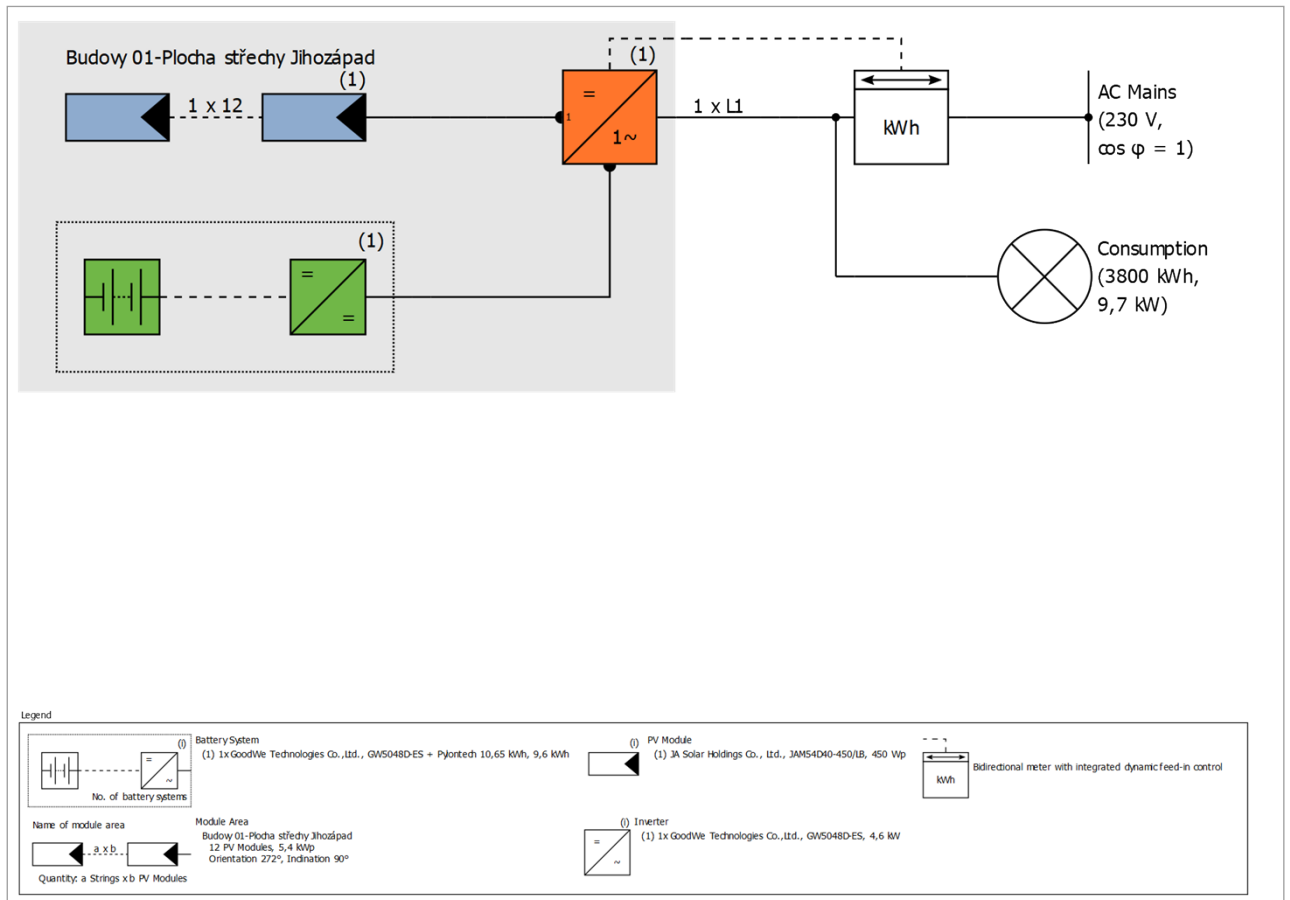


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	5,40 kWp
Spec. Annual Yield	1 093,24 kWh/kWp
Performance Ratio (PR)	74,91 %
Yield Reduction due to Shading	4,6 %
PV Generator Energy (AC grid) with battery	5 545 kWh/Year
Direct Own Use	2 745 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	2 800 kWh/Year
Own Power Consumption	49,5 %
CO ₂ Emissions avoided	2 433 kg / year
Level of Self-sufficiency	72,2 %



Financial Analysis

Your Gain

Total investment costs	0,00 Kč
Internal Rate of Return (IRR)	12,42 %
Amortization Period	8,3 Years
Electricity Production Costs	0,8486 Kč/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 and Battery Systems
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Climate Data

Location	Liberec, CZE (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	3800 kWh
2 osoby s jedním dítětem	3800 kWh
Load Peak	9,7 kW

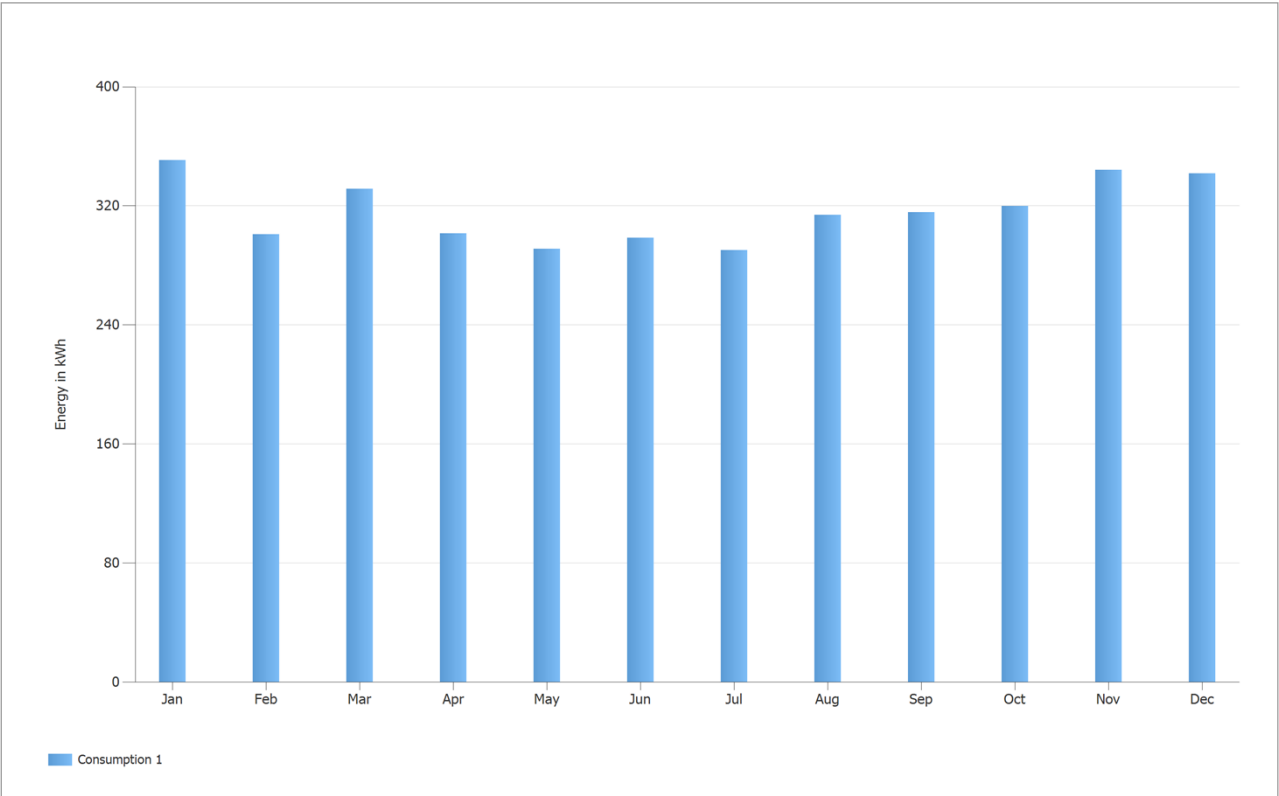


Figure: Consumption

Module Areas

1. Module Area - Budovy 01-Plocha střechy Jihozápad

PV Generator, 1. Module Area - Budovy 01-Plocha střechy Jihozápad

Name	Budovy 01-Plocha střechy Jihozápad
PV Modules	12 x JAM54D40-450/LB (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	90 °
Orientation	West 272 °
Installation Type	Mounted - Roof
PV Generator Surface	24,0 m ²

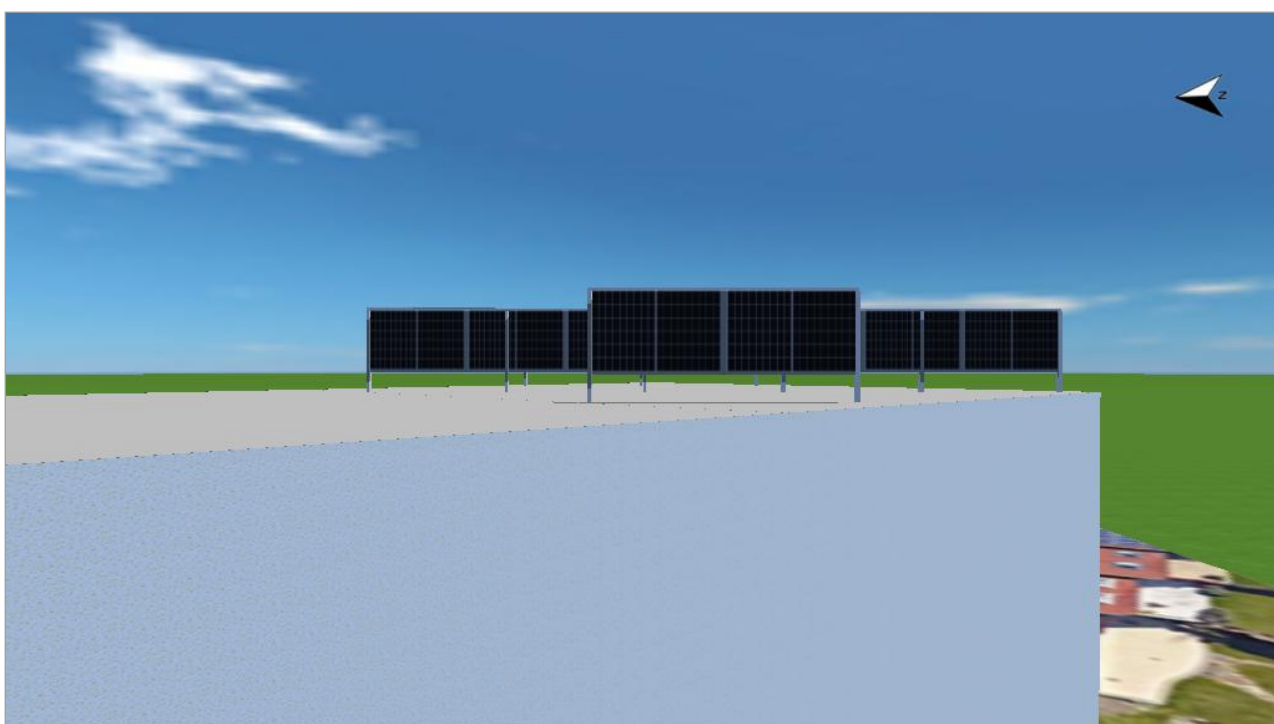


Figure: 1. Module Area - Budovy 01-Plocha střechy Jihozápad



Horizon Line, 3D Design

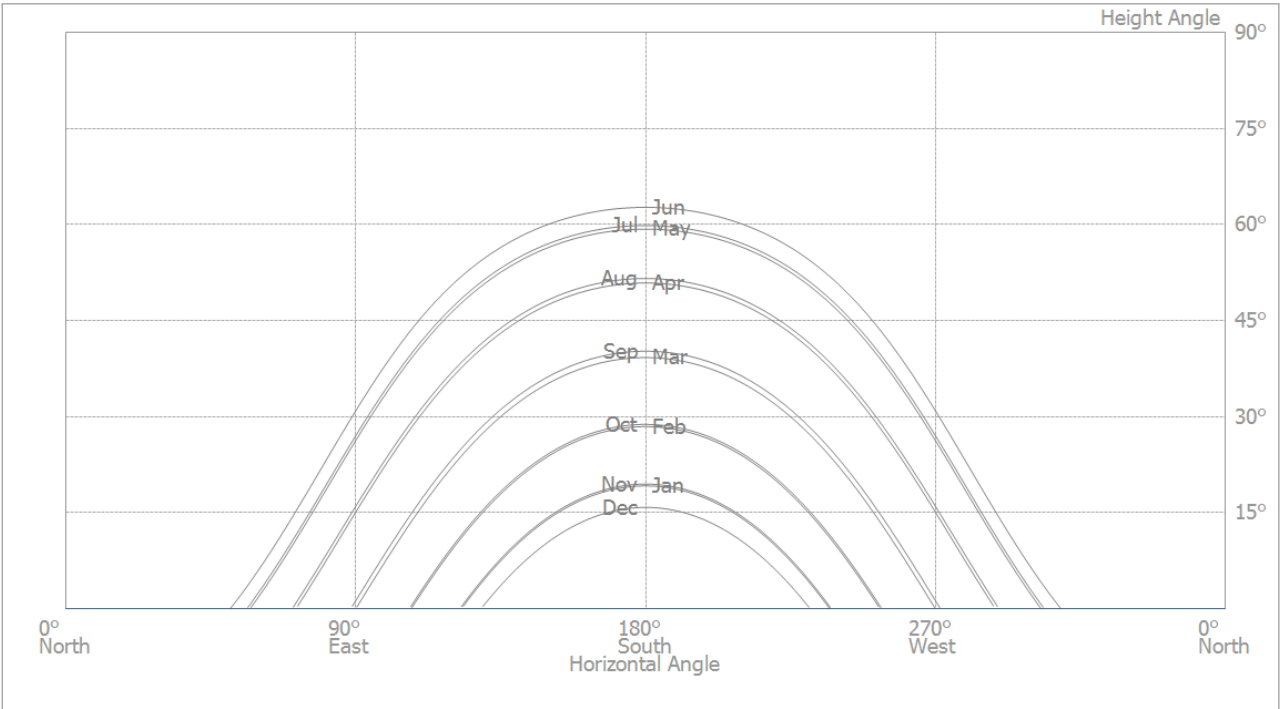


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Area	Budovy 01-Plocha střechy Jihozápad
Inverter 1	
Model	GW5048D-ES (v2)
Manufacturer	GoodWe Technologies Co.,Ltd.
Quantity	1
Sizing Factor	117,4 %
Configuration	MPP 1+2: 1 x 12

AC Mains

AC Mains

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



Battery Systems

Battery System - Skupina 1

Model	GW5048D-ES + Pylontech 10,65 kWh (v2)
Manufacturer	GoodWe Technologies Co.,Ltd.
Quantity	1
Battery Inverter	
Type of Coupling	DC intermediate circuit coupling
Nominal output	4,6 kW
Battery	
Manufacturer	Pylon Technologies Co., Ltd.
Model	Force H2 (v1)
Quantity	3
Battery Energy	9,6 kWh
Battery Type	Lithium iron phosphate

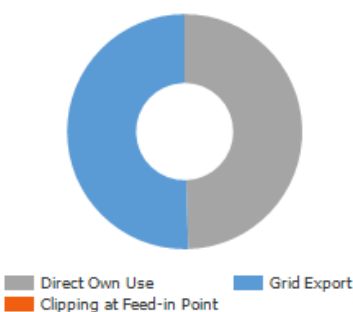
Simulation Results

Results Total System

PV System

PV Generator Output	5,40 kWp
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Performance Ratio (PR)	74,91 %
Yield Reduction due to Shading	4,6 %
PV Generator Energy (AC grid) with battery	5 545 kWh/Year
Direct Own Use	2 745 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	2 800 kWh/Year
Own Power Consumption	49,5 %
CO ₂ Emissions avoided	2 433 kg / year

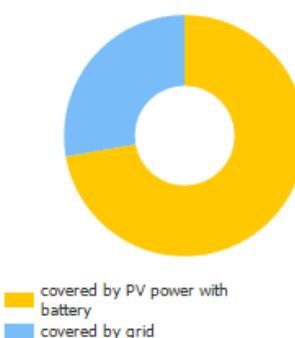
PV Generator Energy (AC grid) with battery



Appliances

Appliances	3 800 kWh/Year
Standby Consumption (Inverter)	0 kWh/Year
Total Consumption	3 800 kWh/Year
covered by PV power with battery	2 745 kWh/Year
covered by grid	1 055 kWh/Year
Solar Fraction	72,2 %

Total Consumption



Battery System

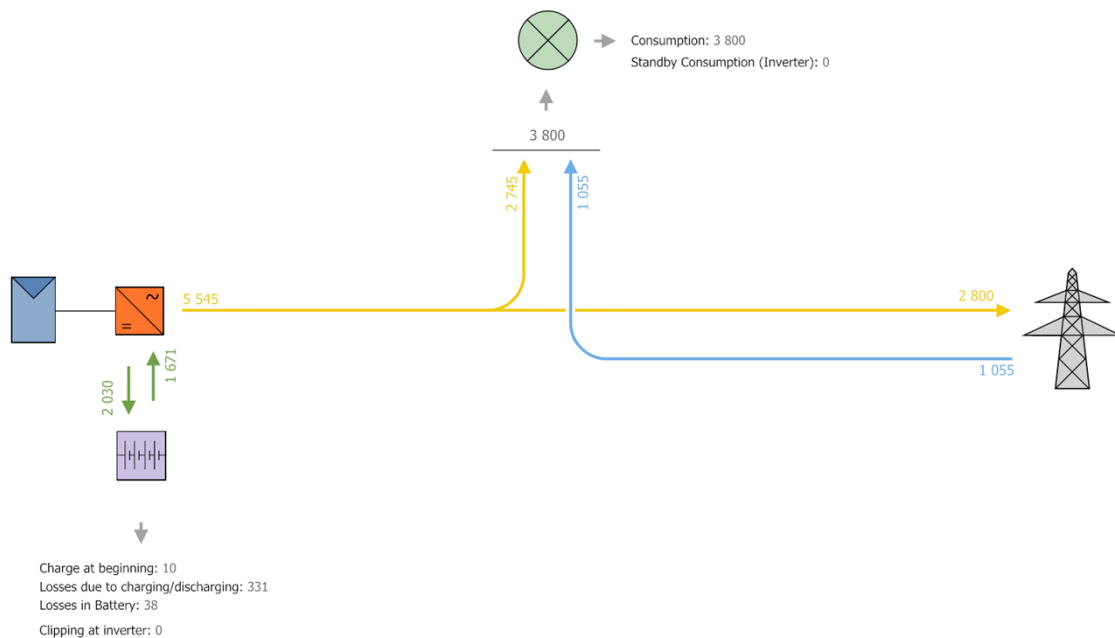
Charge at beginning	10 kWh
Battery Charge (PV System)	2 030 kWh/Year
Battery Energy for the Covering of Consumption	1 671 kWh/Year
Battery discharge into the grid	0 kWh/Year
Losses due to charging/discharging	331 kWh/Year
Losses in Battery	38 kWh/Year
Cycle Load	3,7 %
Service Life	>20 Years

Level of Self-sufficiency

Total Consumption	3 800 kWh/Year
covered by grid	1 055 kWh/Year
Level of Self-sufficiency	72,2 %

Energy Flow Graph

Project: FVE Březina Tomáš Liberec RD613 JA Solar 450 5,4 kWp 10,65 kWh



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

Figure: Energy flow

FVE Březina Tomáš Liberec RD613 JA Solar 450 5,4 kWp 10,65 kWh

Solar Král s.r.o.
Offer Number: P2024-322-2

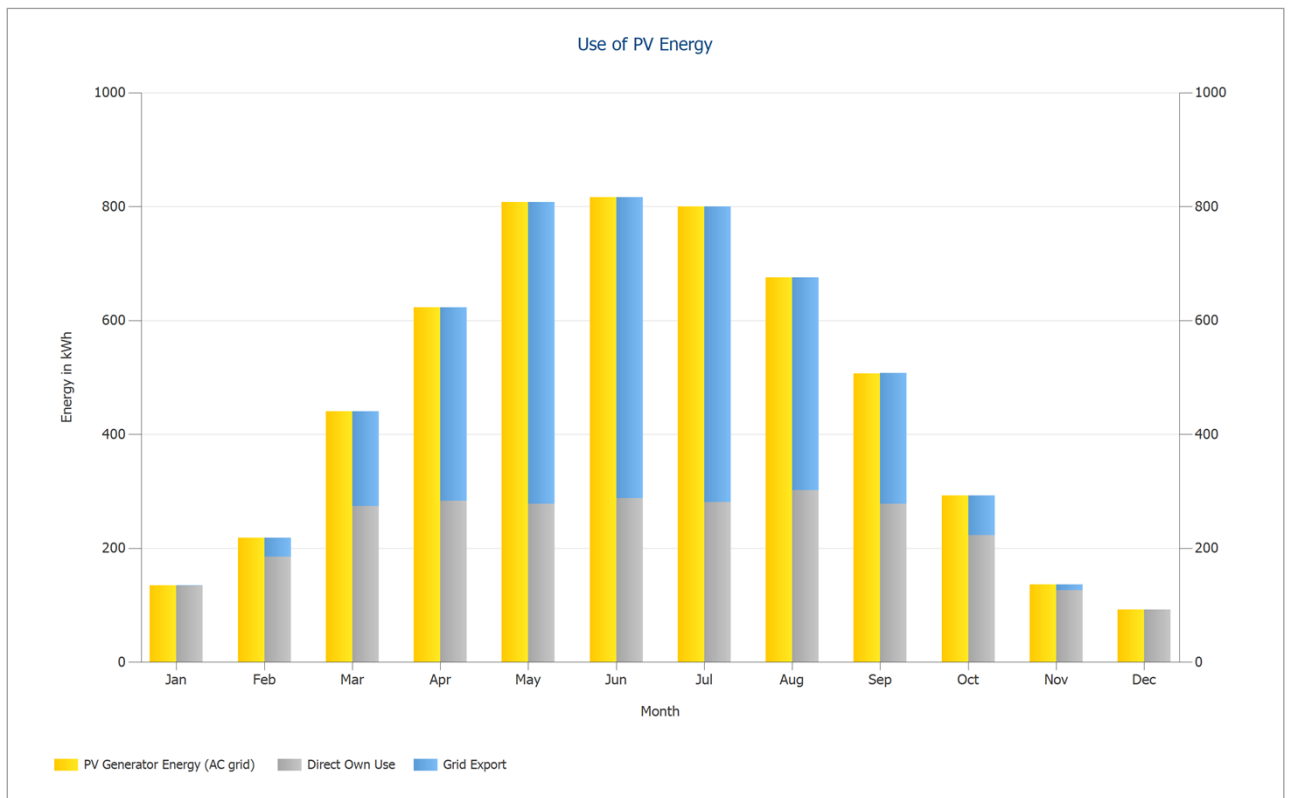


Figure: Use of PV Energy

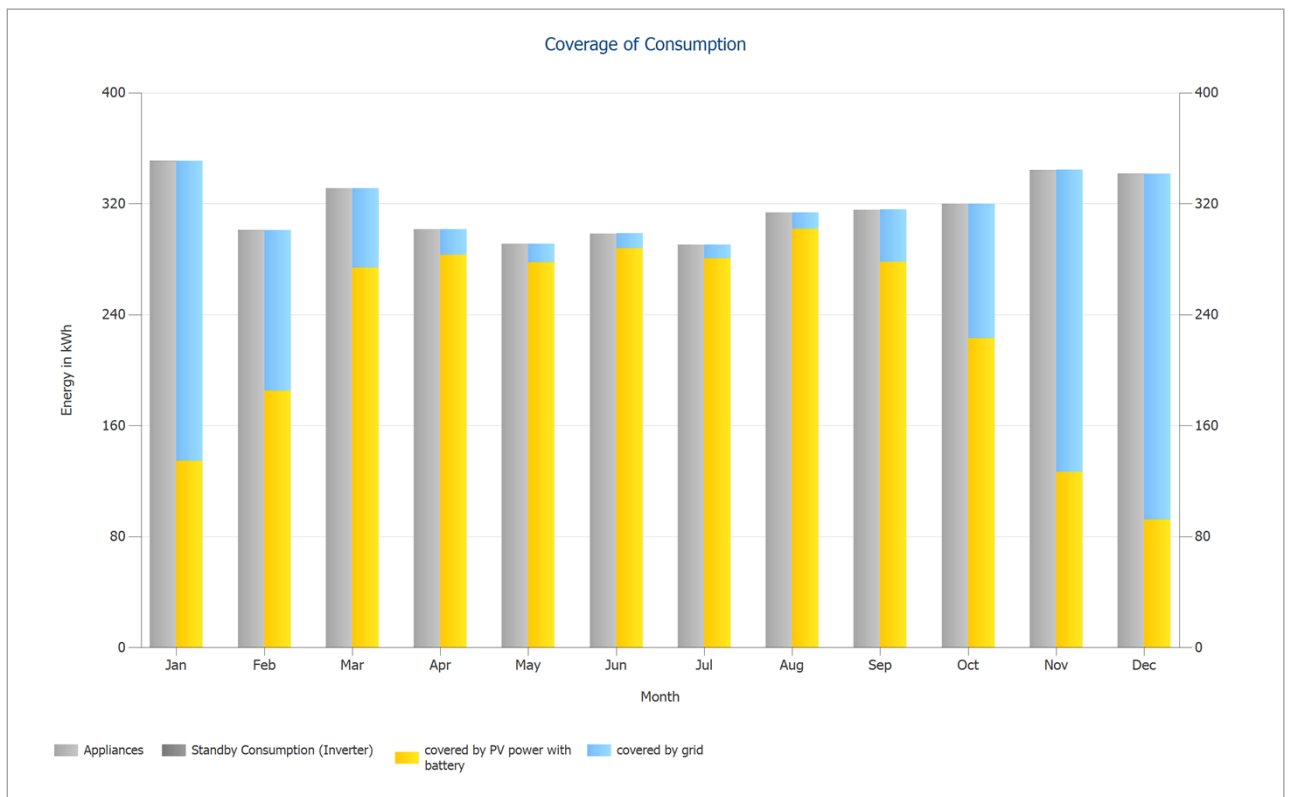


Figure: Coverage of Consumption

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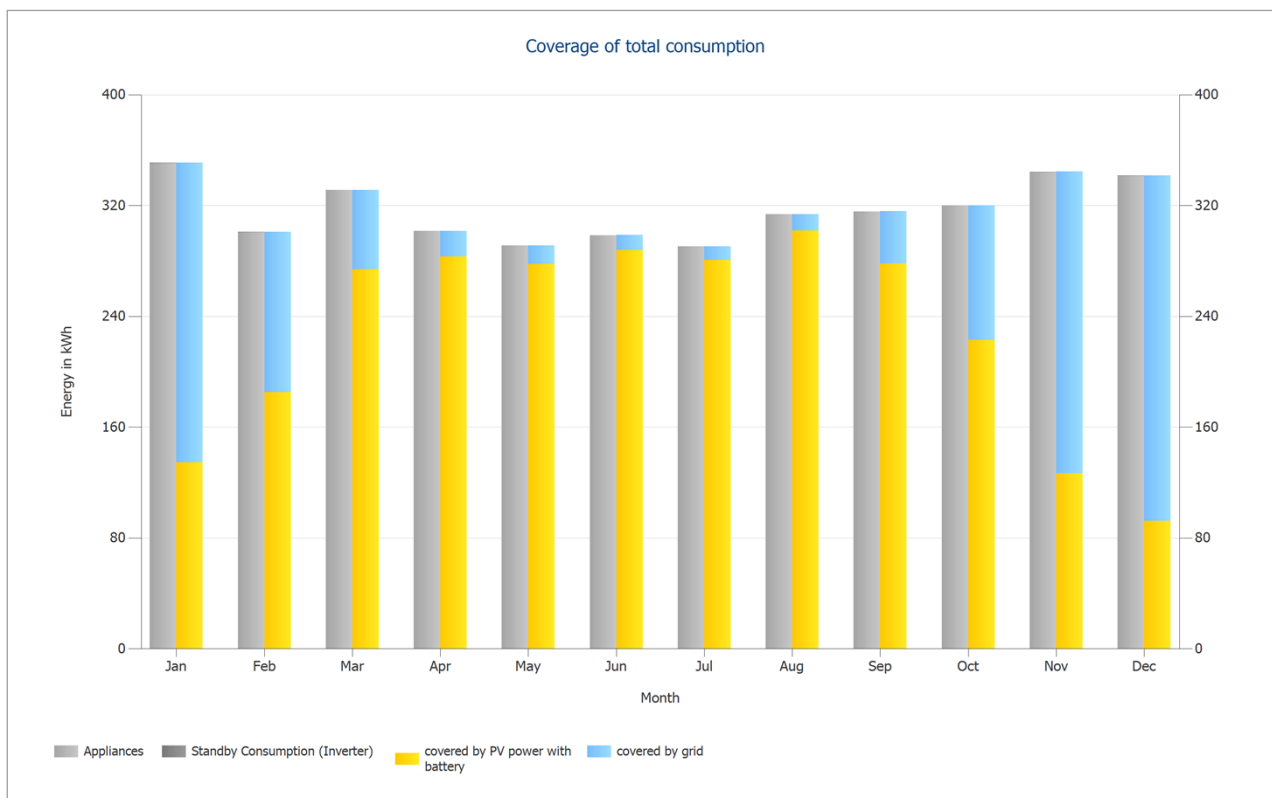


Figure: Coverage of total consumption



Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	2 800 kWh/Year
PV Generator Output	5,4 kWp
Start of Operation of the System	01.03.2025
Assessment Period	40 Years
Interest on Capital	1 %

Economic Parameters

Internal Rate of Return (IRR)	12,42 %
Accrued Cash Flow (Cash Balance)	486 234,51 Kč
Amortization Period	8,3 Years
Electricity Production Costs	0,8486 Kč/kWh

Payment Overview

Specific Investment Costs	0,00 Kč/kWp
Investment Costs	0,00 Kč
One-off Payments	308 999,00 Kč
Incoming Subsidies	154 499,00 Kč
Annual Costs	0,00 Kč/Year
Other Revenue or Savings	0,00 Kč/Year

Remuneration and Savings

Total Payment from Utility in First Year	1 400,18 Kč/Year
First year savings	18 113,77 Kč/Year

ČEZ Distribuce - Stavební systém

Validity	30.09.2024 - 29.09.2064
Specific feed-in / export Remuneration	0,5 Kč/kWh
Feed-in / Export Tariff	1386,2194 Kč/Year

ČEZ domácnost fix3 (ČEZ)

Energy Price	6,6 Kč/kWh
Base Price	358,33 Kč/Month

Remuneration of Electricity sold to Third Party

Price of Electricity sold to Third Party	0,50 Kč/kWh
Remuneration of Electricity sold to Third Party	13,96 Kč/Year

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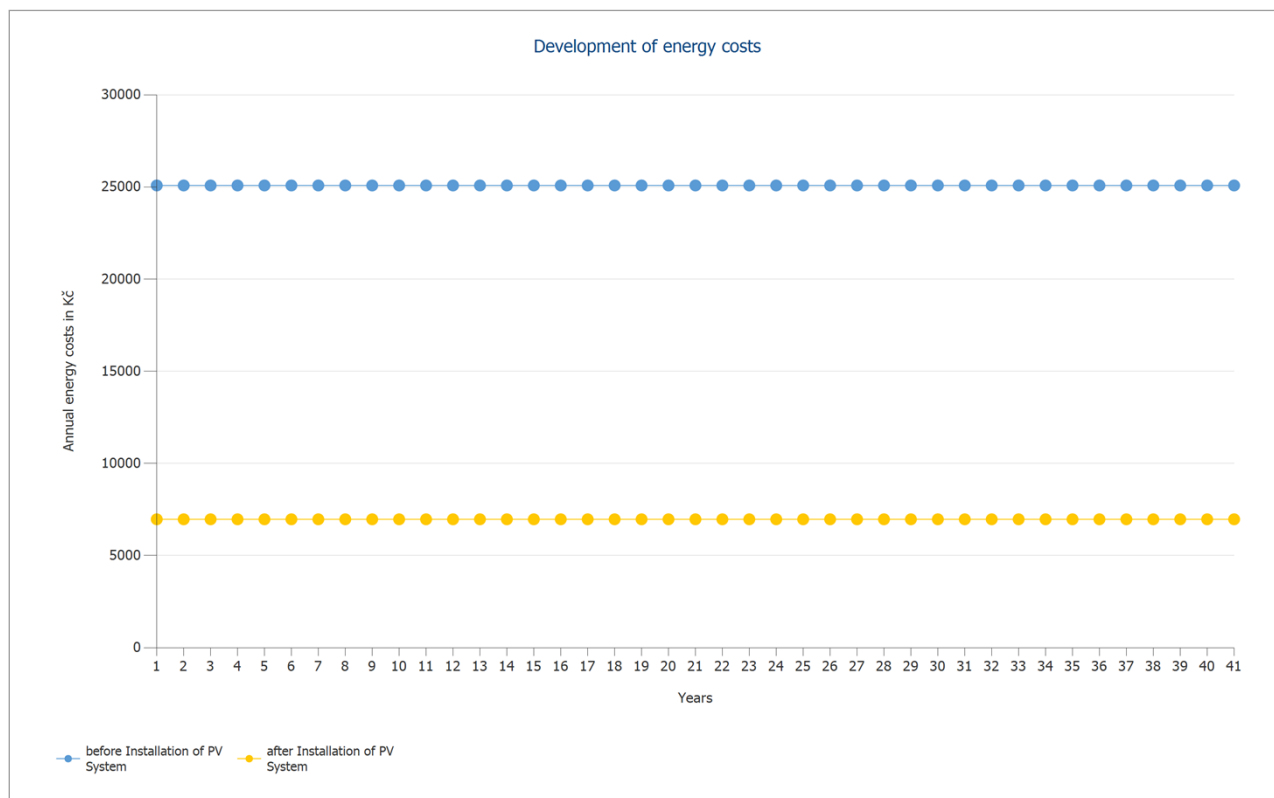


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
One-off Payments	-308 999,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	154 499,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 386,32 Kč	1 372,59 Kč	1 359,00 Kč	1 345,55 Kč	1 332,23 Kč
Electricity Savings	17 934,42 Kč	17 756,86 Kč	17 581,05 Kč	17 406,98 Kč	17 234,63 Kč
Annual Cash Flow	-135 179,25 Kč	19 129,45 Kč	18 940,05 Kč	18 752,52 Kč	18 566,86 Kč
Accrued Cash Flow (Cash Balance)	-135 179,25 Kč	-116 049,80 Kč	-97 109,75 Kč	-78 357,23 Kč	-59 790,37 Kč

Cash flow

	Year 6	Year 7	Year 8	Year 9	Year 10
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 319,04 Kč	1 305,98 Kč	1 293,05 Kč	1 280,24 Kč	1 267,57 Kč
Electricity Savings	17 063,99 Kč	16 895,04 Kč	16 727,76 Kč	16 562,14 Kč	16 398,16 Kč
Annual Cash Flow	18 383,03 Kč	18 201,02 Kč	18 020,81 Kč	17 842,38 Kč	17 665,73 Kč
Accrued Cash Flow (Cash Balance)	-41 407,35 Kč	-23 206,33 Kč	-5 185,52 Kč	12 656,86 Kč	30 322,59 Kč

Cash flow

	Year 11	Year 12	Year 13	Year 14	Year 15
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 255,02 Kč	1 242,59 Kč	1 230,29 Kč	1 218,11 Kč	1 206,05 Kč
Electricity Savings	16 235,80 Kč	16 075,05 Kč	15 915,89 Kč	15 758,31 Kč	15 602,29 Kč
Annual Cash Flow	17 490,82 Kč	17 317,64 Kč	17 146,18 Kč	16 976,42 Kč	16 808,33 Kč
Accrued Cash Flow (Cash Balance)	47 813,41 Kč	65 131,05 Kč	82 277,23 Kč	99 253,64 Kč	116 061,98 Kč

Cash flow

	Year 16	Year 17	Year 18	Year 19	Year 20
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 194,11 Kč	1 182,28 Kč	1 170,58 Kč	1 158,99 Kč	1 147,51 Kč
Electricity Savings	15 447,81 Kč	15 294,86 Kč	15 143,42 Kč	14 993,49 Kč	14 845,04 Kč
Annual Cash Flow	16 641,91 Kč	16 477,14 Kč	16 314,00 Kč	16 152,48 Kč	15 992,55 Kč
Accrued Cash Flow (Cash Balance)	132 703,89 Kč	149 181,03 Kč	165 495,03 Kč	181 647,51 Kč	197 640,06 Kč

Cash flow

	Year 21	Year 22	Year 23	Year 24	Year 25
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 136,15 Kč	1 124,90 Kč	1 113,76 Kč	1 102,74 Kč	1 091,82 Kč
Electricity Savings	14 698,06 Kč	14 552,53 Kč	14 408,45 Kč	14 265,79 Kč	14 124,55 Kč
Annual Cash Flow	15 834,21 Kč	15 677,44 Kč	15 522,21 Kč	15 368,53 Kč	15 216,36 Kč
Accrued Cash Flow (Cash Balance)	213 474,27 Kč	229 151,71 Kč	244 673,92 Kč	260 042,45 Kč	275 258,82 Kč

FVE Březina Tomáš Liberec RD613 JA Solar 450 5,4 kWp 10,65 kWh

Solar Král s.r.o.
Offer Number: P2024-322-2



Cash flow

	Year 26	Year 27	Year 28	Year 29	Year 30
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 081,01 Kč	1 070,31 Kč	1 059,71 Kč	1 049,22 Kč	1 038,83 Kč
Electricity Savings	13 984,70 Kč	13 846,24 Kč	13 709,14 Kč	13 573,41 Kč	13 439,02 Kč
Annual Cash Flow	15 065,71 Kč	14 916,54 Kč	14 768,85 Kč	14 622,63 Kč	14 477,85 Kč
Accrued Cash Flow (Cash Balance)	290 324,52 Kč	305 241,06 Kč	320 009,92 Kč	334 632,54 Kč	349 110,39 Kč

Cash flow

	Year 31	Year 32	Year 33	Year 34	Year 35
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 028,54 Kč	1 018,36 Kč	1 008,28 Kč	998,29 Kč	988,41 Kč
Electricity Savings	13 305,96 Kč	13 174,22 Kč	13 043,78 Kč	12 914,63 Kč	12 786,77 Kč
Annual Cash Flow	14 334,50 Kč	14 192,58 Kč	14 052,06 Kč	13 912,93 Kč	13 775,18 Kč
Accrued Cash Flow (Cash Balance)	363 444,90 Kč	377 637,47 Kč	391 689,53 Kč	405 602,46 Kč	419 377,64 Kč

Cash flow

	Year 36	Year 37	Year 38	Year 39	Year 40
One-off Payments	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	978,62 Kč	968,93 Kč	959,34 Kč	949,84 Kč	940,44 Kč
Electricity Savings	12 660,17 Kč	12 534,82 Kč	12 410,71 Kč	12 287,83 Kč	12 166,17 Kč
Annual Cash Flow	13 638,79 Kč	13 503,75 Kč	13 370,05 Kč	13 237,67 Kč	13 106,61 Kč
Accrued Cash Flow (Cash Balance)	433 016,42 Kč	446 520,18 Kč	459 890,23 Kč	473 127,90 Kč	486 234,51 Kč

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

FVE Březina Tomáš Liberec RD613 JA Solar 450 5,4 kWp 10,65 kWh

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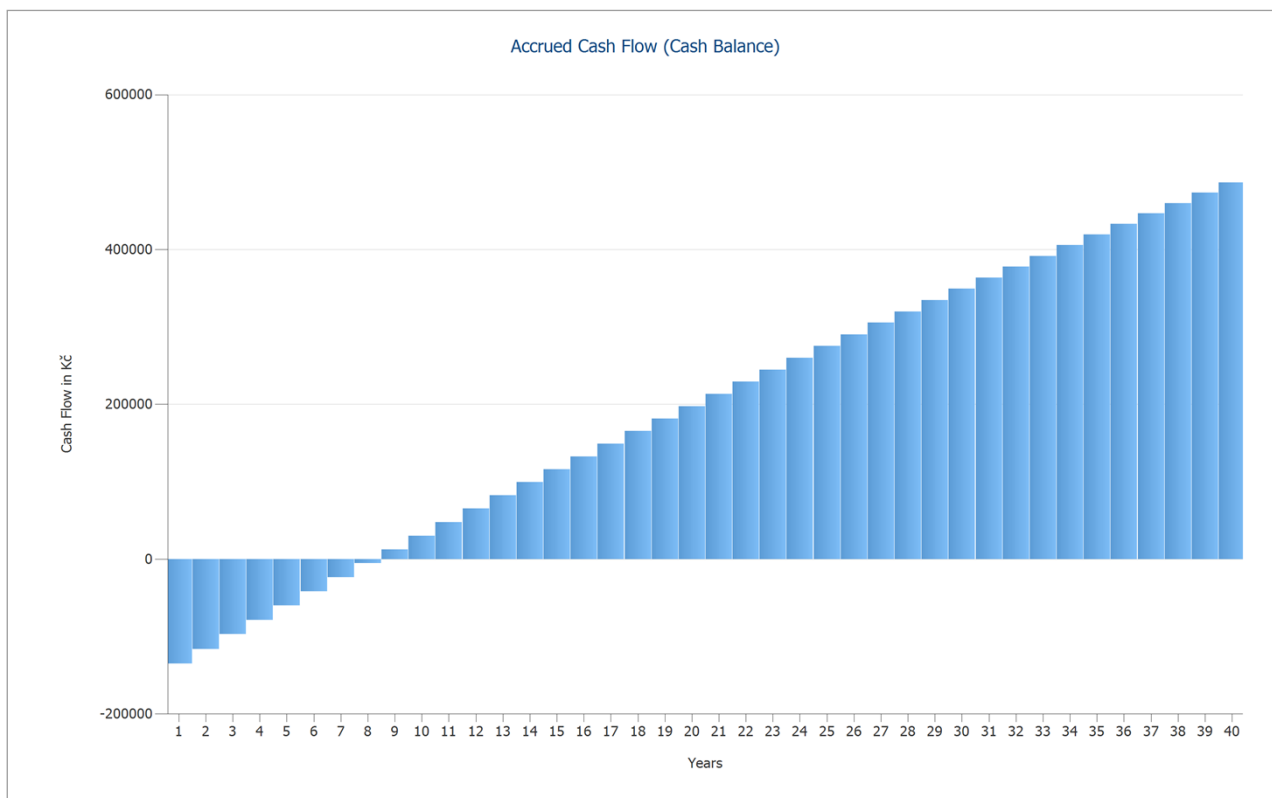


Figure: Accrued Cash Flow (Cash Balance)



Plans and parts list

Circuit Diagram

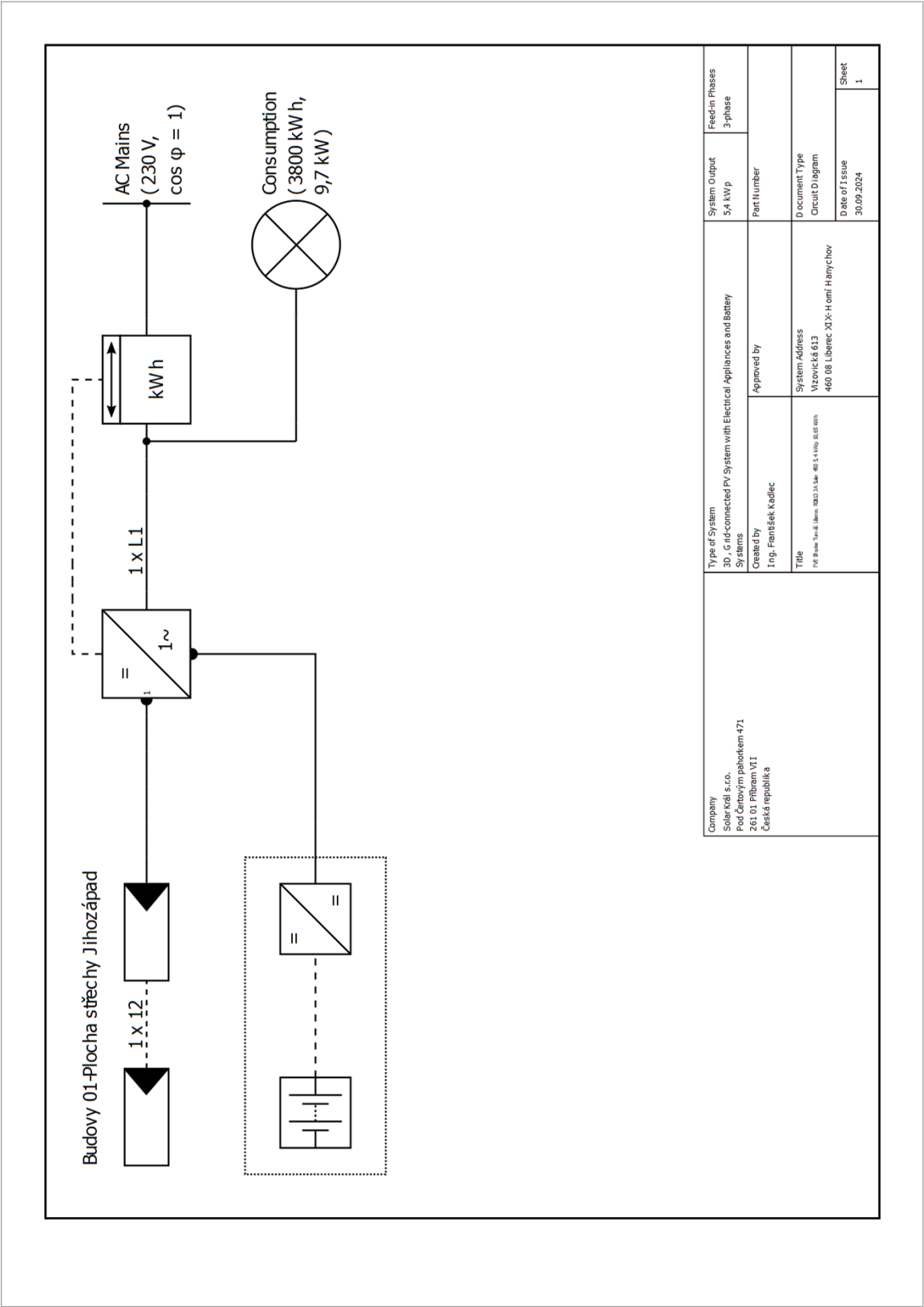


Figure: Circuit Diagram

Overview plan

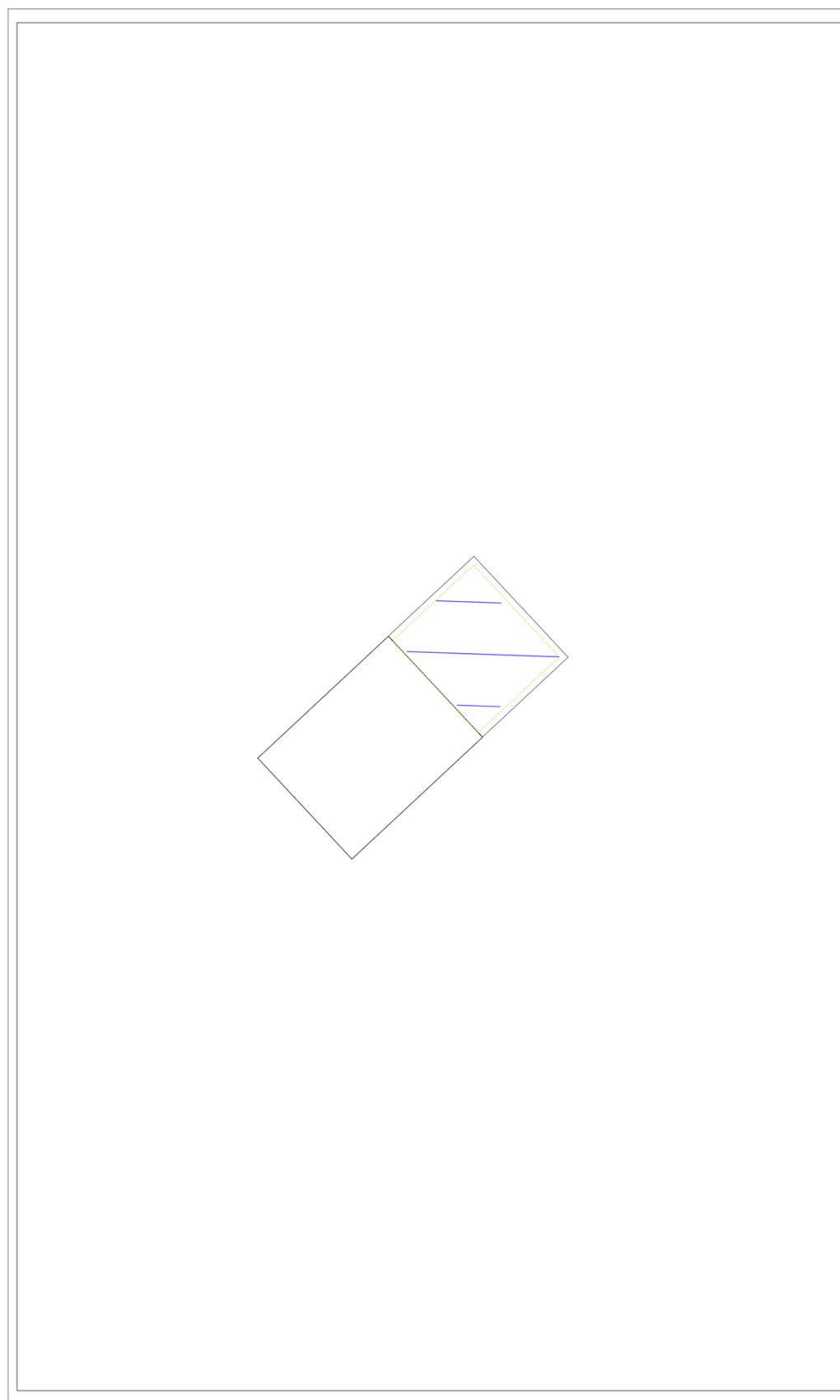


Figure: Overview plan

Dimensioning Plan

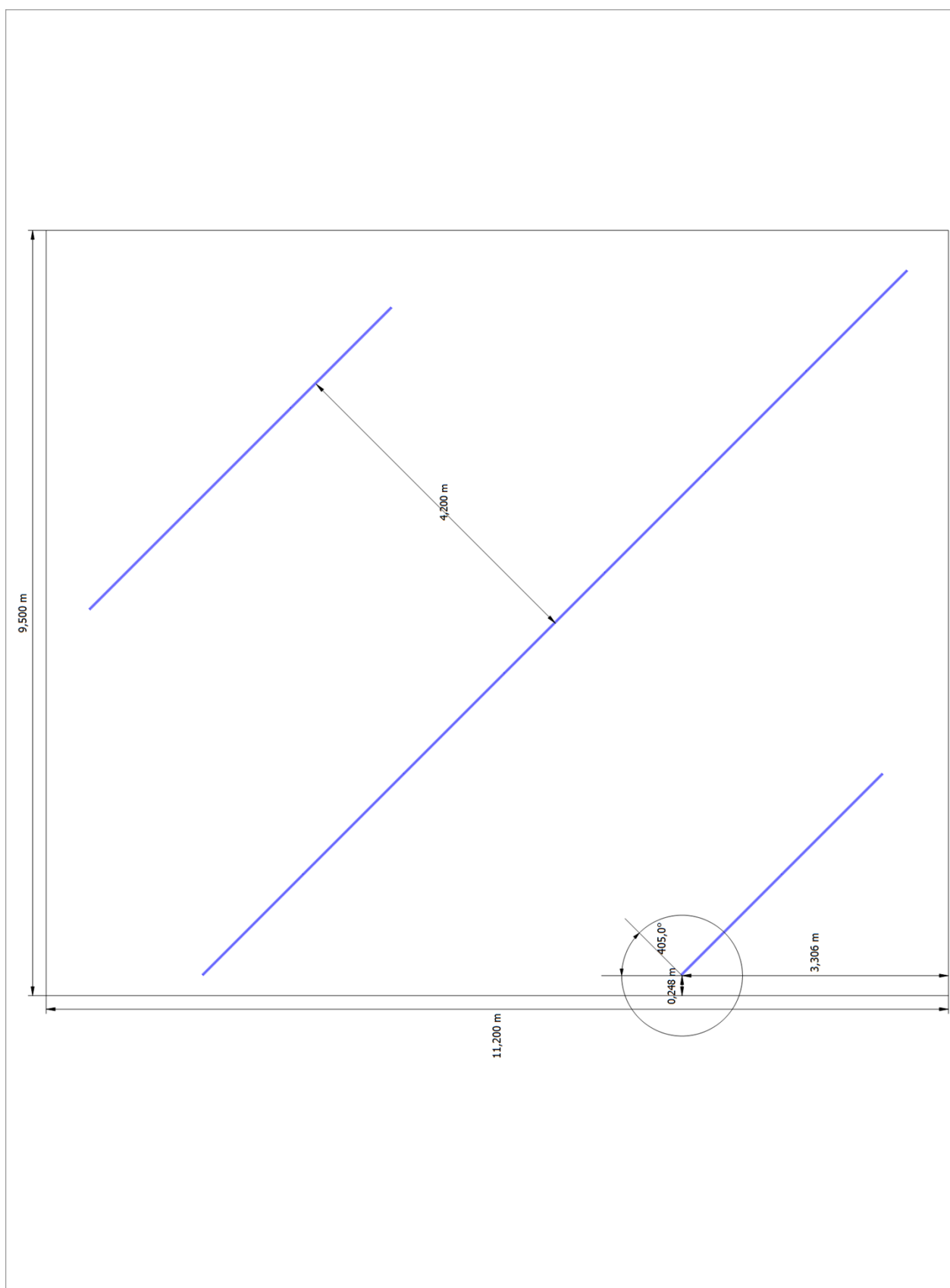


Figure: Budovy 01 - Plocha střechy Jihozápad

String Plan

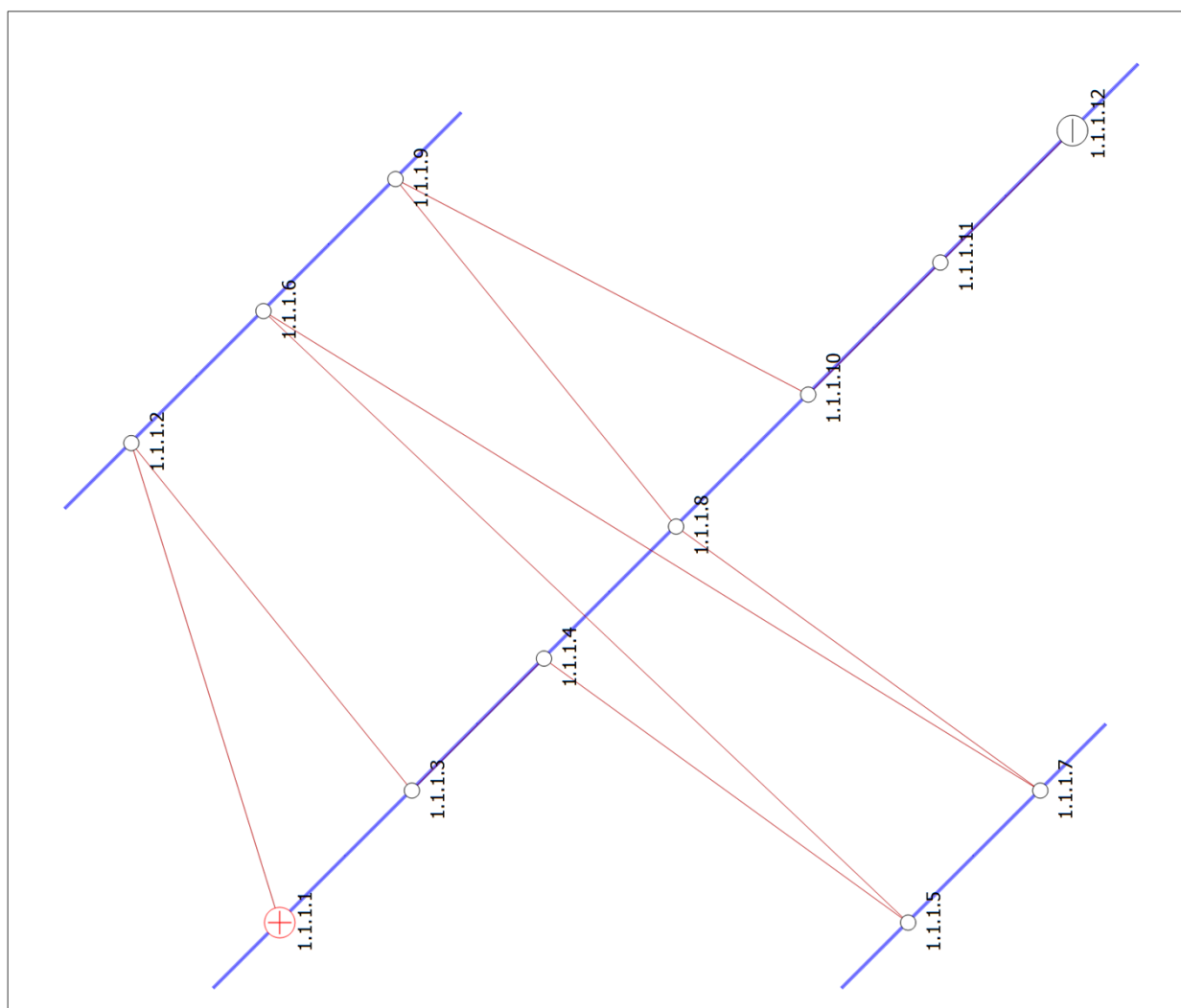


Figure: Budovy 01 - Plocha střechy Jihozápad

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		JA Solar Holdings Co., Ltd.	JAM54D40-450/LB	12	Piece
2	Inverter		GoodWe Technologies Co.,Ltd.	GW5048D-ES	1	Piece
3	Battery System		GoodWe Technologies Co.,Ltd.	GW5048D-ES + Pylontech 10,65 kWh	1	Piece
4	Components			Bidirectional meter with integrated dynamic feed-in control	1	Piece