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

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Soukr. RD
Jan Březina
Vizovická 612
460 08 Liberec XIX- Horní Hanychov

Customer No.: 2024-321
Project Name: FVE Březina Jan Liberec RD612 JA Solar450 8,1 kWp 14,2 kWh
Offer no.: P2024-321-2

30.09.2024

Your PV system from Solar Král s.r.o.

Address of Installation

Vizovická 612
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

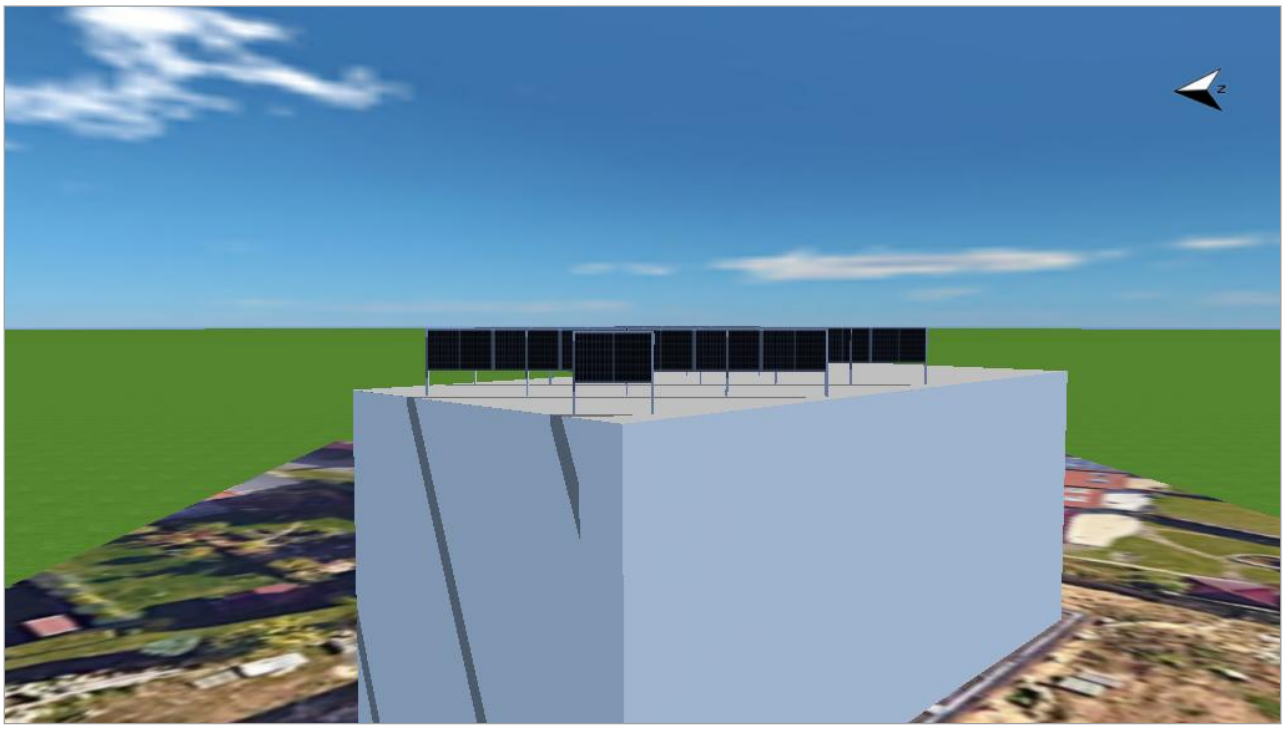


Figure: Overview Image, 3D Design

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	8,1	kWp
PV Generator Surface	36,0	m²
Number of PV Modules	18	
Number of Inverters	1	
No. of battery systems	1	

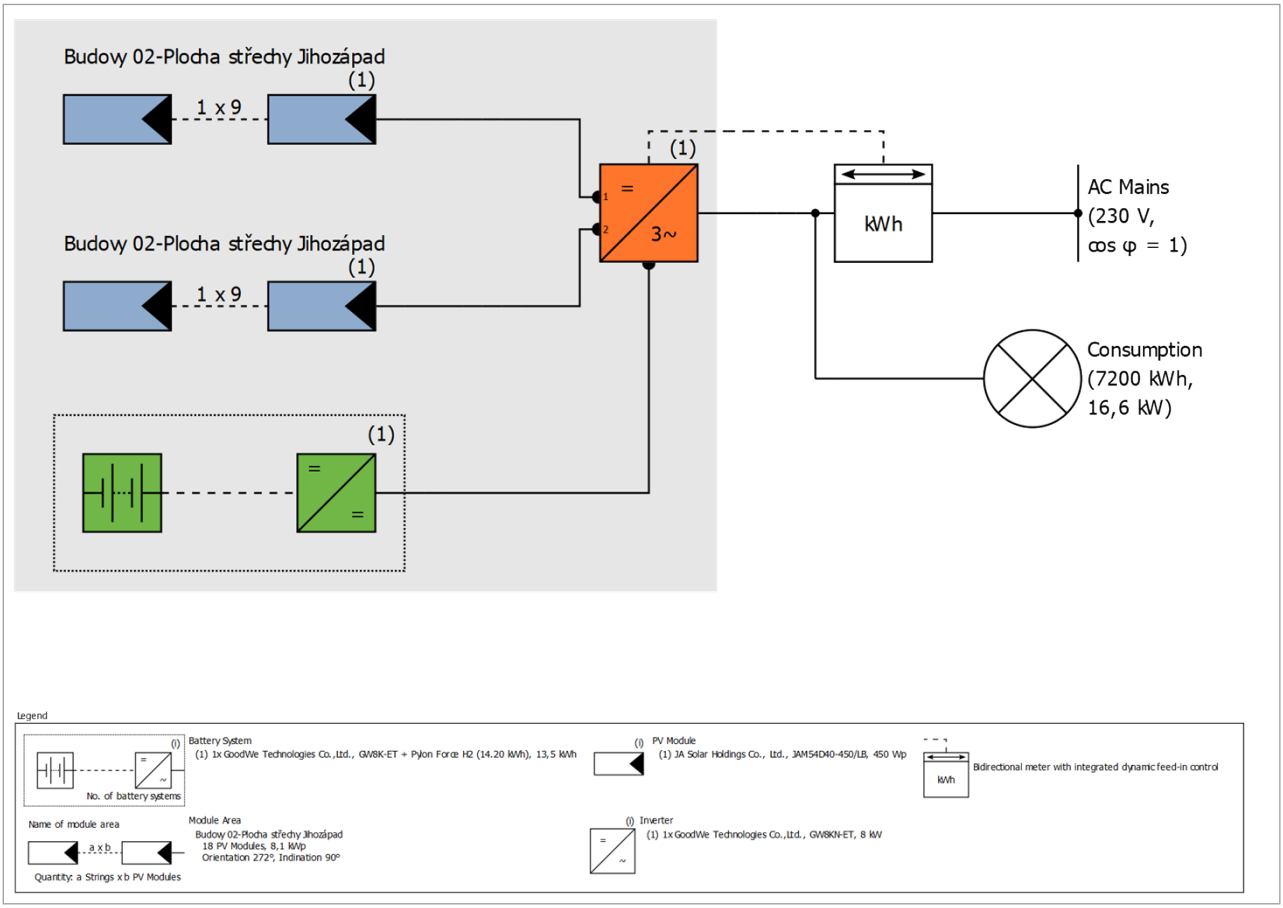


Figure: Schematic diagram

Production Forecast

Production Forecast		
PV Generator Output	8,10	kWp
Spec. Annual Yield	1 121,87	kWh/kWp
Performance Ratio (PR)	76,87	%
Yield Reduction due to Shading	6,0	%
PV Generator Energy (AC grid) with battery	8 853	kWh/Year
Direct Own Use	4 987	kWh/Year
Clipping at Feed-in Point	0	kWh/Year
Grid Export	3 867	kWh/Year
Own Power Consumption	56,1	%
CO_2 Emissions avoided	4 010	kg / year
Level of Self-sufficiency	68,9	%

Financial Analysis

Your Gain

Total investment costs	0,00	Kč
Internal Rate of Return (IRR)	12,01	%
Amortization Period	8,6	Years
Electricity Production Costs	0,9773	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

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	7200 kWh
2 osoby se 2 dětmi	7200 kWh
Load Peak	16,6 kW

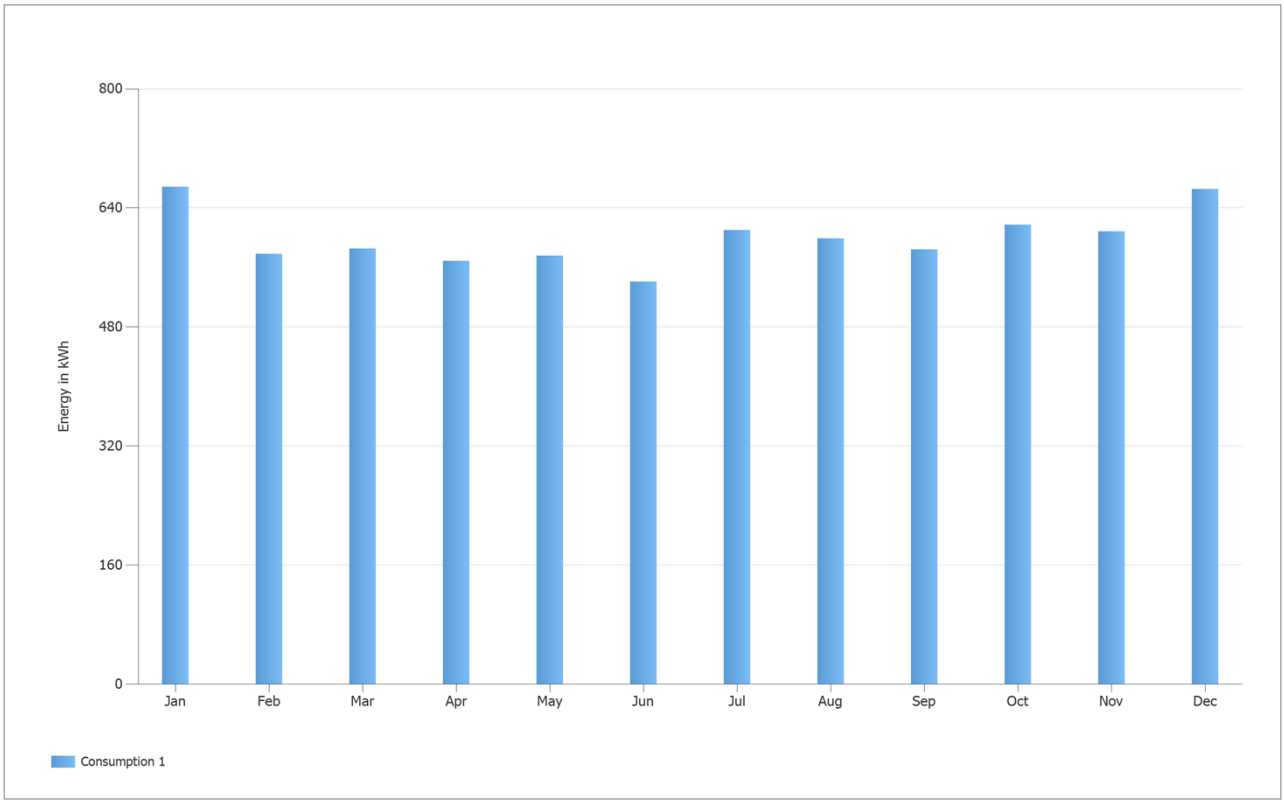


Figure: Consumption

Module Areas

1. Module Area - Budovy 02-Plocha střechy Jihozápad

PV Generator, 1. Module Area - Budovy 02-Plocha střechy Jihozápad

Name	Budovy 02-Plocha střechy Jihozápad	
PV Modules	18 x JAM54D40-450/LB (v1)	
Manufacturer	JA Solar Holdings Co., Ltd.	
Inclination	90	°
Orientation	West 272	°
Installation Type	Mounted - Roof	
PV Generator Surface	36,0	m²

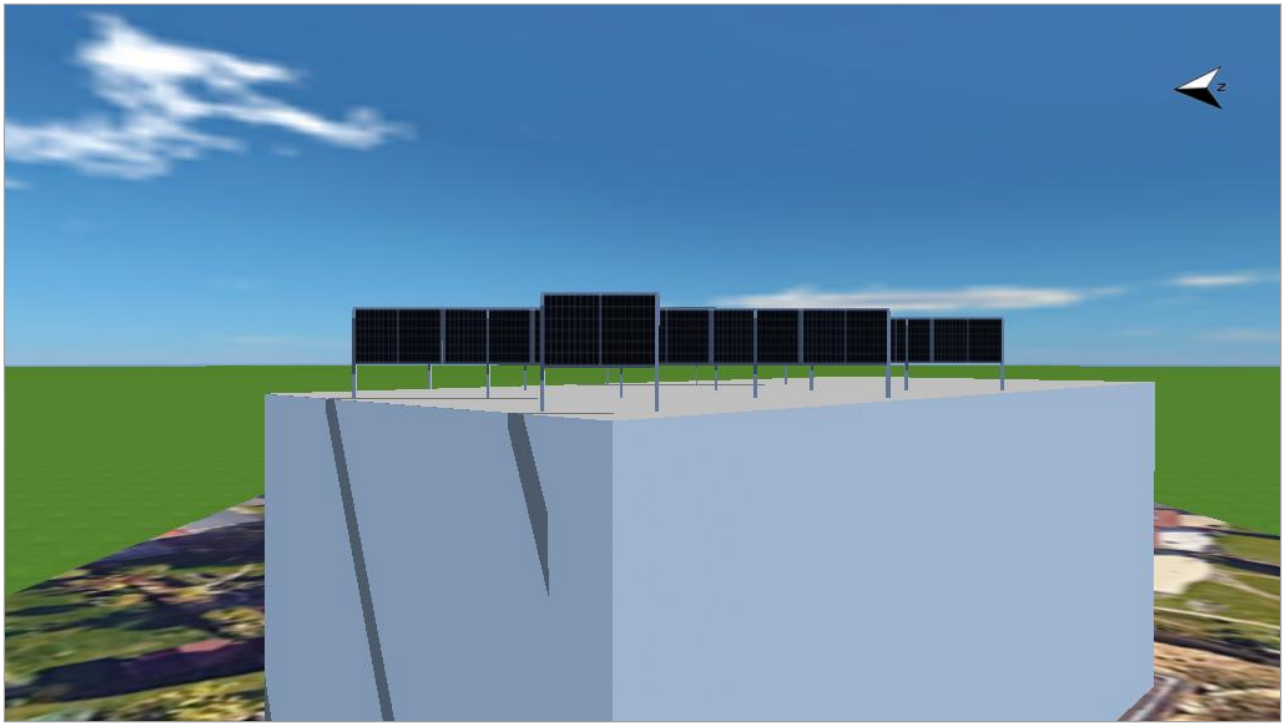


Figure: 1. Module Area - Budovy 02-Plocha střechy Jihozápad

Horizon Line, 3D Design

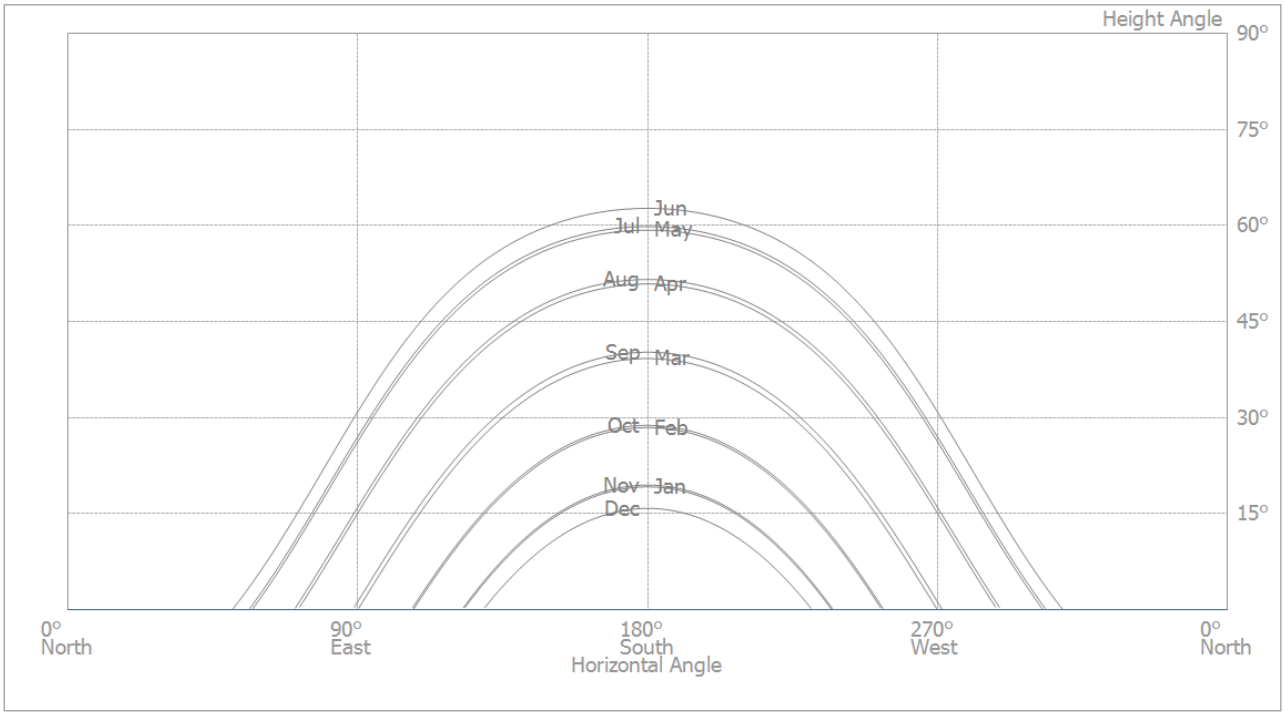


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1	
Module Area	Budovy 02-Plocha střechy Jihozápad
Inverter 1	
Model	GW8KN-ET (v3)
Manufacturer	GoodWe Technologies Co.,Ltd.
Quantity	1
Sizing Factor	101,3 %
Configuration	MPP 1: 1 x 9
	MPP 2: 1 x 9

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

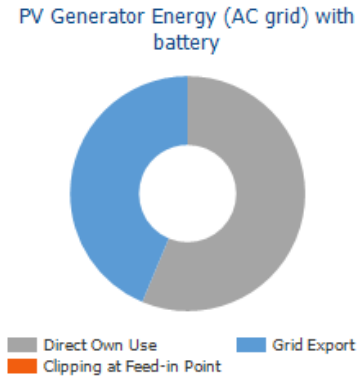
Model	GW8K-ET + Pylon Force H2 (14.20 kWh) (v1)	
Manufacturer	GoodWe Technologies Co.,Ltd.	
Quantity	1	
Battery Inverter		
Type of Coupling	DC intermediate circuit coupling	
Nominal output	8	kW
Battery		
Manufacturer	Pylon Technologies Co., Ltd.	
Model	Force H2 (v1)	
Quantity	4	
Battery Energy	13,5	kWh
Battery Type	Lithium iron phosphate	

Simulation Results

Results Total System

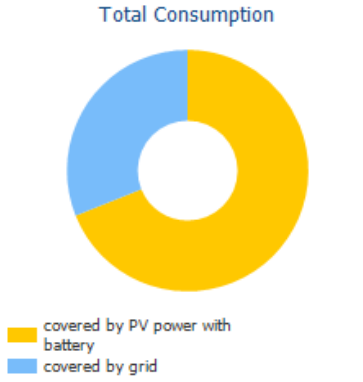
PV System

PV Generator Output	8,10	kWp
Spec. Annual Yield	1 121,87	kWh/kWp
Performance Ratio (PR)	76,87	%
Yield Reduction due to Shading	6,0	%
PV Generator Energy (AC grid) with battery	8 853	kWh/Year
Direct Own Use	4 987	kWh/Year
Clipping at Feed-in Point	0	kWh/Year
Grid Export	3 867	kWh/Year
Own Power Consumption	56,1	%
CO_2 Emissions avoided	4 010	kg / year



Appliances

Appliances	7 200	kWh/Year
Standby Consumption (Inverter)	37	kWh/Year
Total Consumption	7 237	kWh/Year
covered by PV power with battery	4 987	kWh/Year
covered by grid	2 249	kWh/Year
Solar Fraction	68,9	%



Battery System

Charge at beginning	14	kWh
Battery Charge (PV System)	3 158	kWh/Year
Battery Energy for the Covering of Consumption	2 887	kWh/Year
Battery discharge into the grid	0	kWh/Year
Losses due to charging/discharging	210	kWh/Year
Losses in Battery	75	kWh/Year
Cycle Load	4,7	%
Service Life	>20	Years

Level of Self-sufficiency

Total Consumption	7 237	kWh/Year
covered by grid	2 249	kWh/Year
Level of Self-sufficiency	68,9	%

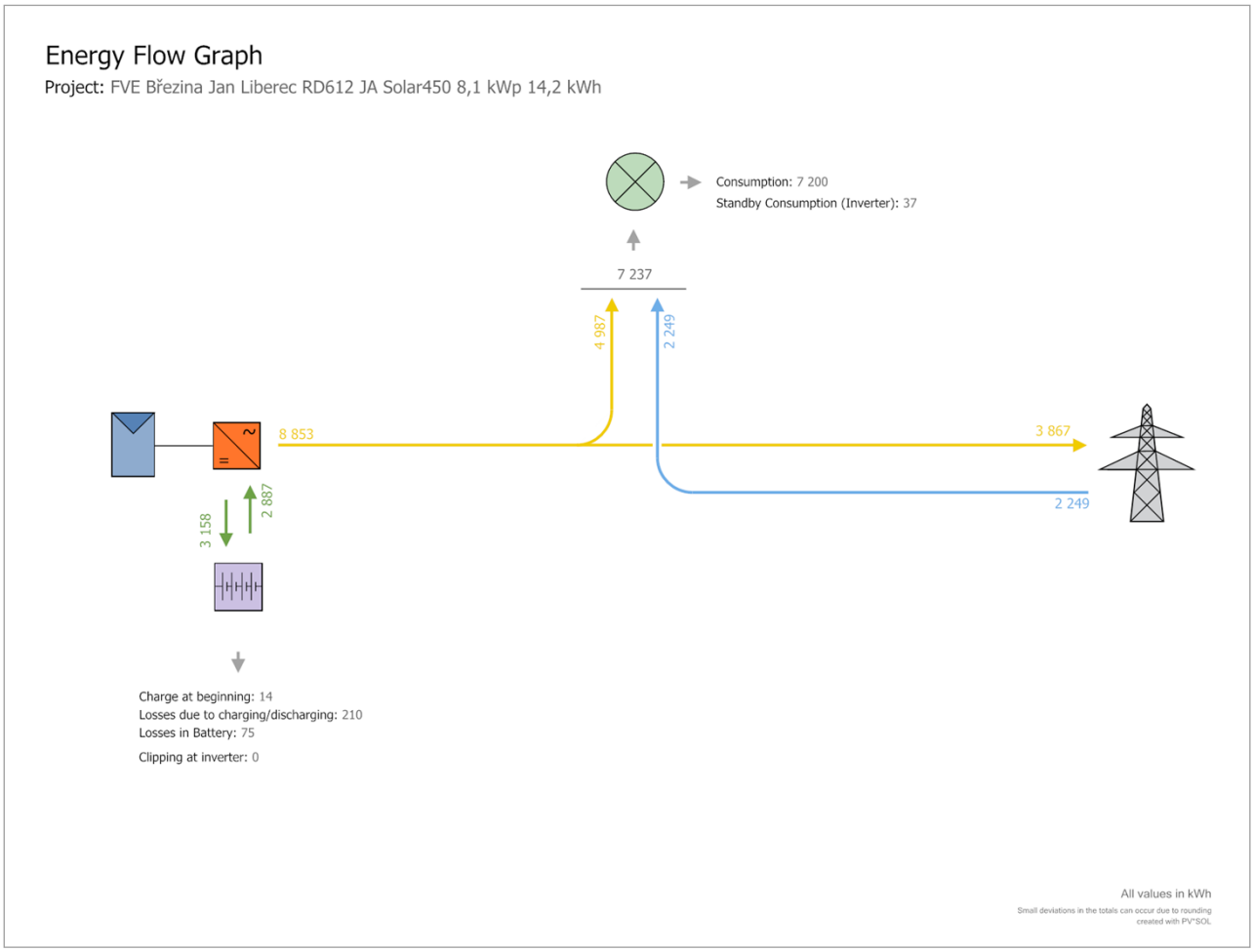


Figure: Energy flow

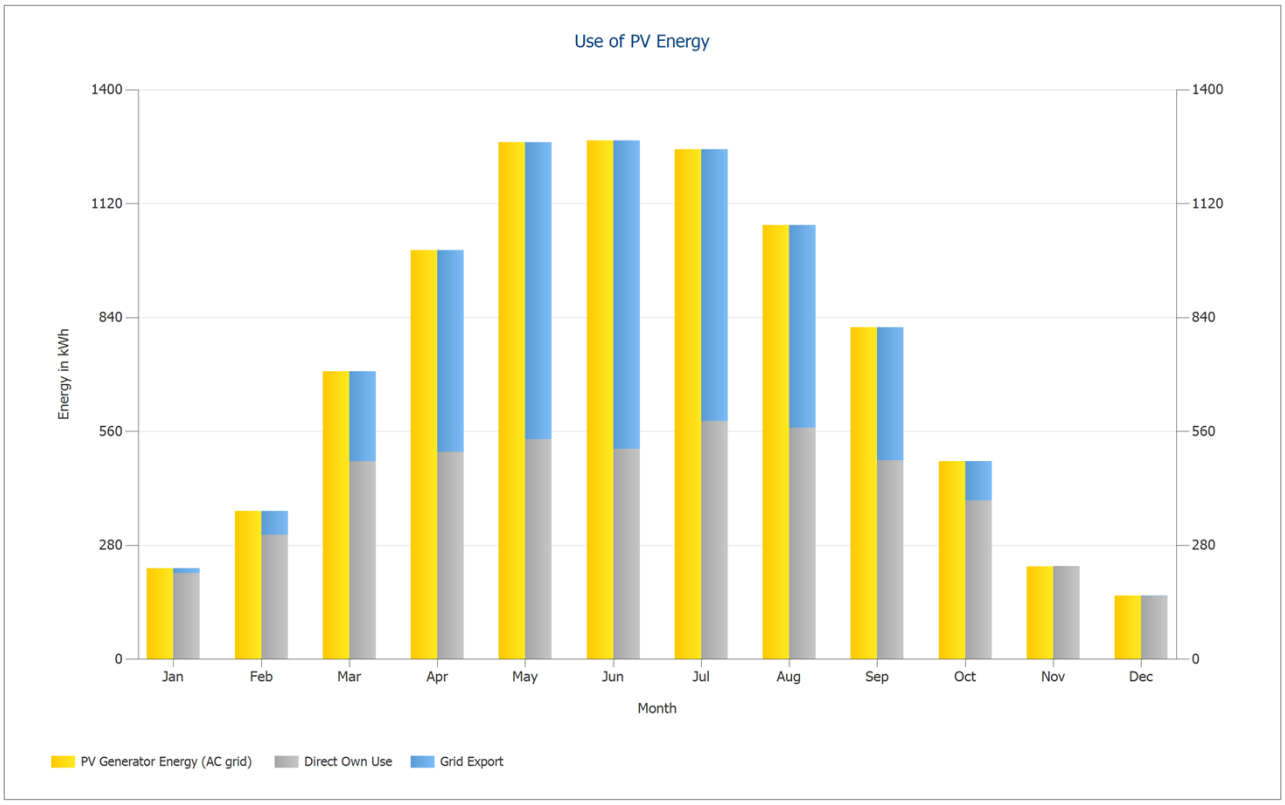


Figure: Use of PV Energy

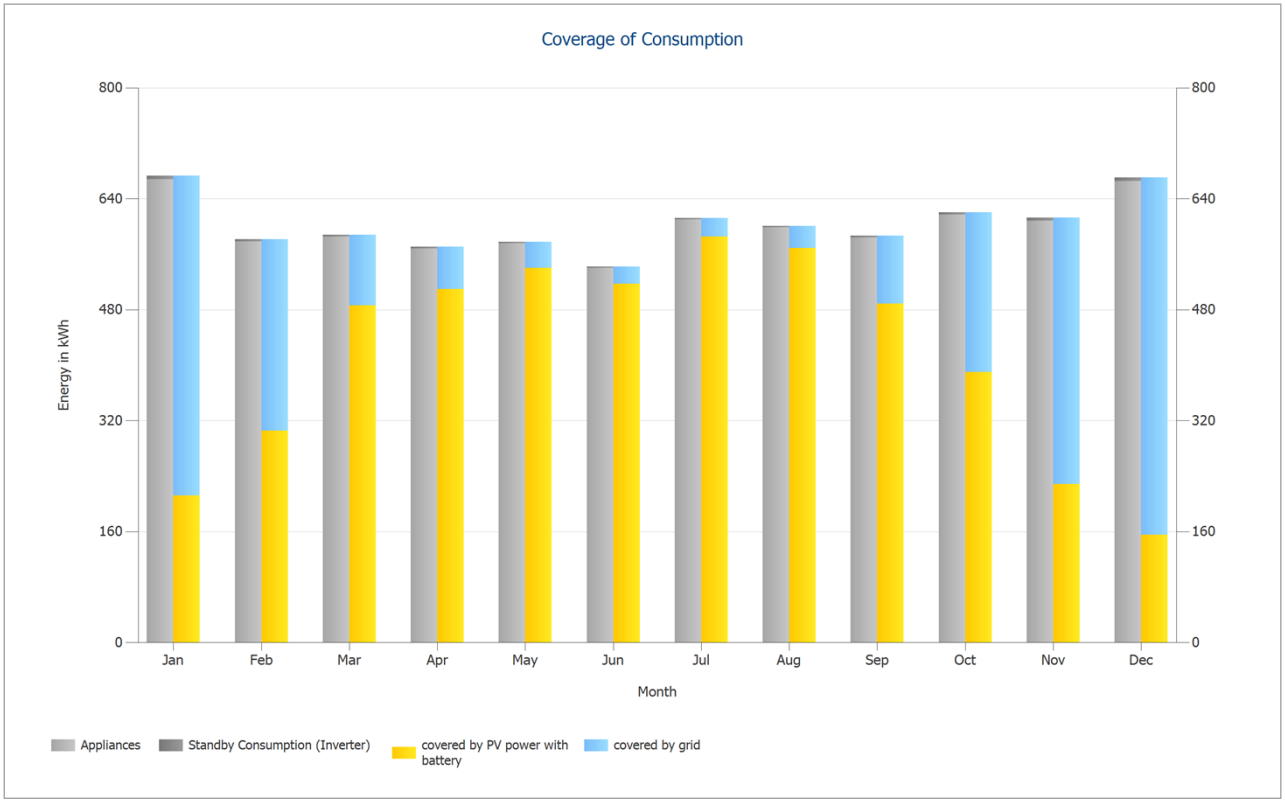


Figure: Coverage of Consumption

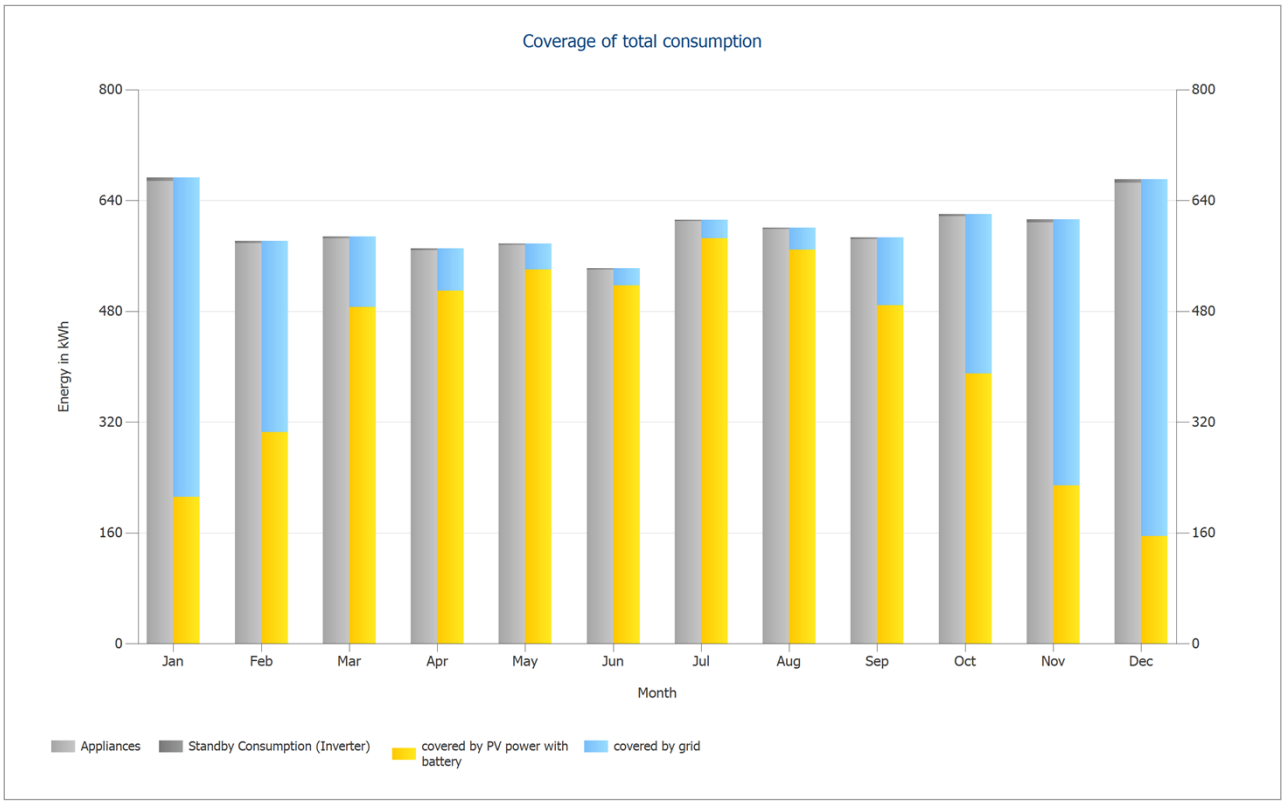


Figure: Coverage of total consumption

Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	3 867	kWh/Year
PV Generator Output	8,1	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)	12,01	%
Accrued Cash Flow (Cash Balance)	853 441,64	Kč
Amortization Period	8,6	Years
Electricity Production Costs	0,9773	Kč/kWh

Payment Overview

Specific Investment Costs	0,00	Kč/kWp
Investment Costs	0,00	Kč
One-off Payments	442 899,00	Kč
Incoming Subsidies	160 000,00	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	1 933,35	Kč/Year
First year savings	32 674,58	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	1933,3533	Kč/Year
ČEZ domácnost fix3 (ČEZ)		
Energy Price	6,6	Kč/kWh
Base Price	358,33	Kč/Month

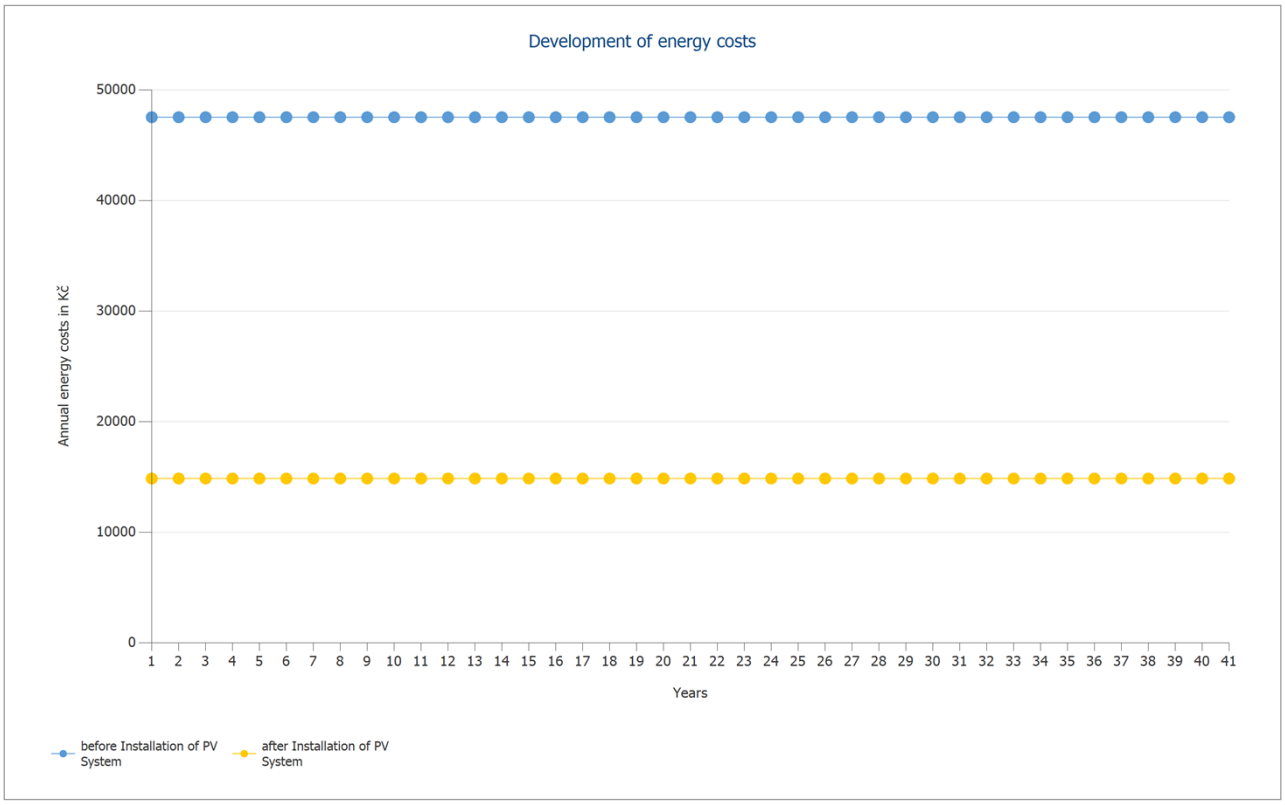


Figure: Development of energy costs

Cash flow

Cash flow

	Year 1	Year 2	Year 3	Year 4	Year 5
One-off Payments	-442 899,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Incoming Subsidies	160 000,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč	0,00 Kč
Feed-in / Export Tariff	1 914,21 Kč	1 895,26 Kč	1 876,49 Kč	1 857,91 Kč	1 839,52 Kč
Electricity Savings	32 351,07 Kč	32 030,76 Kč	31 713,63 Kč	31 399,63 Kč	31 088,74 Kč
Annual Cash Flow	**-248 633,72 Kč**	**33 926,02 Kč**	**33 590,12 Kč**	**33 257,54 Kč**	**32 928,26 Kč**
Accrued Cash Flow (Cash Balance)	-248 633,72 Kč	-214 707,70 Kč	-181 117,58 Kč	-147 860,03 Kč	-114 931,77 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	1 821,31 Kč	1 803,27 Kč	1 785,42 Kč	1 767,74 Kč	1 750,24 Kč
Electricity Savings	30 780,93 Kč	30 476,17 Kč	30 174,43 Kč	29 875,67 Kč	29 579,87 Kč
Annual Cash Flow	**32 602,24 Kč**	**32 279,44 Kč**	**31 959,85 Kč**	**31 643,41 Kč**	**31 330,11 Kč**
Accrued Cash Flow (Cash Balance)	-82 329,53 Kč	-50 050,09 Kč	-18 090,24 Kč	13 553,17 Kč	44 883,28 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	1 732,91 Kč	1 715,75 Kč	1 698,77 Kč	1 681,95 Kč	1 665,29 Kč
Electricity Savings	29 287,00 Kč	28 997,03 Kč	28 709,93 Kč	28 425,68 Kč	28 144,23 Kč
Annual Cash Flow	**31 019,91 Kč**	**30 712,78 Kč**	**30 408,70 Kč**	**30 107,62 Kč**	**29 809,53 Kč**
Accrued Cash Flow (Cash Balance)	75 903,19 Kč	106 615,98 Kč	137 024,67 Kč	167 132,29 Kč	196 941,82 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	1 648,80 Kč	1 632,48 Kč	1 616,32 Kč	1 600,31 Kč	1 584,47 Kč
Electricity Savings	27 865,58 Kč	27 589,68 Kč	27 316,52 Kč	27 046,05 Kč	26 778,27 Kč
Annual Cash Flow	**29 514,38 Kč**	**29 222,16 Kč**	**28 932,83 Kč**	**28 646,37 Kč**	**28 362,74 Kč**
Accrued Cash Flow (Cash Balance)	226 456,20 Kč	255 678,36 Kč	284 611,19 Kč	313 257,56 Kč	341 620,30 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	1 568,78 Kč	1 553,25 Kč	1 537,87 Kč	1 522,64 Kč	1 507,57 Kč
Electricity Savings	26 513,14 Kč	26 250,63 Kč	25 990,73 Kč	25 733,39 Kč	25 478,61 Kč
Annual Cash Flow	**28 081,92 Kč**	**27 803,88 Kč**	**27 528,60 Kč**	**27 256,04 Kč**	**26 986,17 Kč**
Accrued Cash Flow (Cash Balance)	369 702,22 Kč	397 506,11 Kč	425 034,70 Kč	452 290,74 Kč	479 276,91 Kč

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	1 492,64 Kč	1 477,86 Kč	1 463,23 Kč	1 448,74 Kč	1 434,40 Kč
Electricity Savings	25 226,34 Kč	24 976,58 Kč	24 729,28 Kč	24 484,44 Kč	24 242,02 Kč
Annual Cash Flow	**26 718,98 Kč**	**26 454,44 Kč**	**26 192,52 Kč**	**25 933,18 Kč**	**25 676,42 Kč**
Accrued Cash Flow (Cash Balance)	505 995,90 Kč	532 450,34 Kč	558 642,85 Kč	584 576,04 Kč	610 252,46 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	1 420,20 Kč	1 406,14 Kč	1 392,21 Kč	1 378,43 Kč	1 364,78 Kč
Electricity Savings	24 002,00 Kč	23 764,36 Kč	23 529,07 Kč	23 296,10 Kč	23 065,45 Kč
Annual Cash Flow	**25 422,20 Kč**	**25 170,49 Kč**	**24 921,28 Kč**	**24 674,53 Kč**	**24 430,23 Kč**
Accrued Cash Flow (Cash Balance)	635 674,65 Kč	660 845,15 Kč	685 766,43 Kč	710 440,96 Kč	734 871,19 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	1 351,27 Kč	1 337,89 Kč	1 324,64 Kč	1 311,53 Kč	1 298,54 Kč
Electricity Savings	22 837,08 Kč	22 610,97 Kč	22 387,10 Kč	22 165,44 Kč	21 945,98 Kč
Annual Cash Flow	**24 188,35 Kč**	**23 948,86 Kč**	**23 711,74 Kč**	**23 476,97 Kč**	**23 244,53 Kč**
Accrued Cash Flow (Cash Balance)	759 059,54 Kč	783 008,40 Kč	806 720,14 Kč	830 197,12 Kč	853 441,64 Kč

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

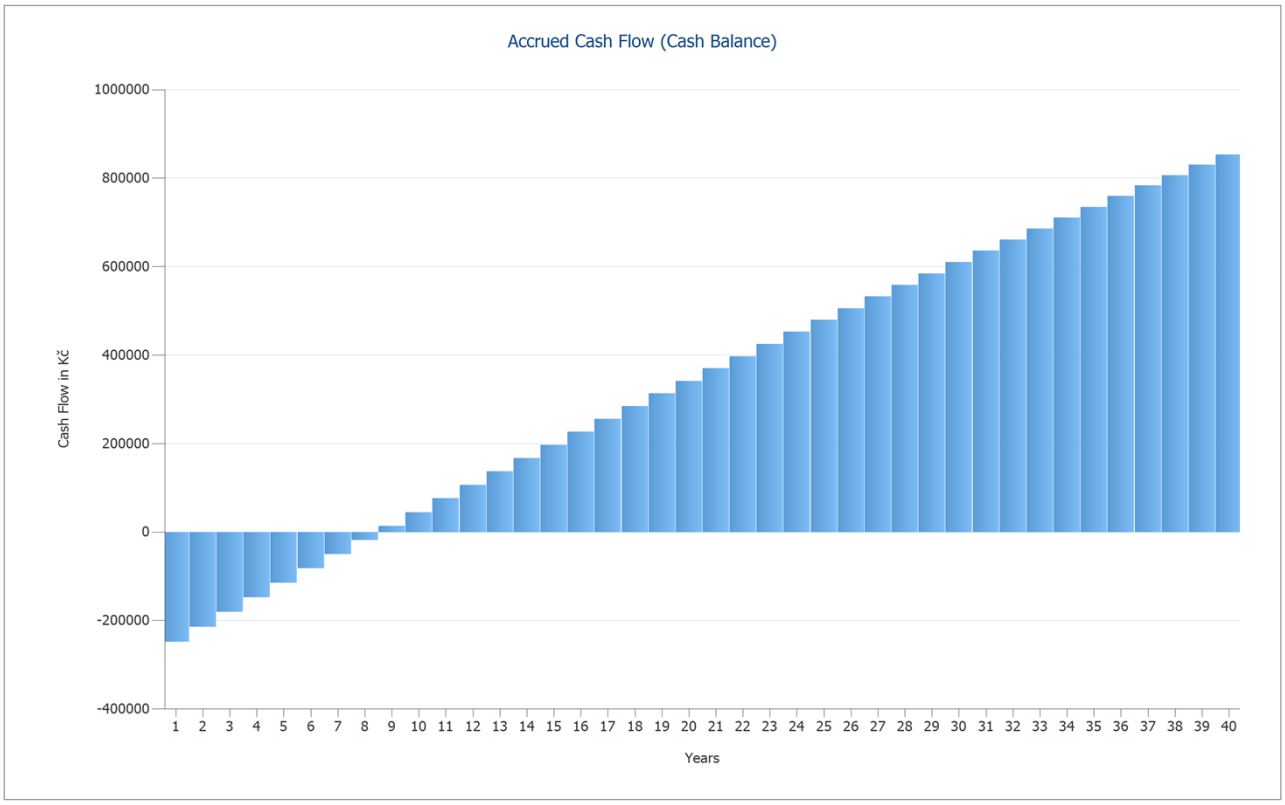


Figure: Accrued Cash Flow (Cash Balance)

Plans and parts list

Circuit Diagram

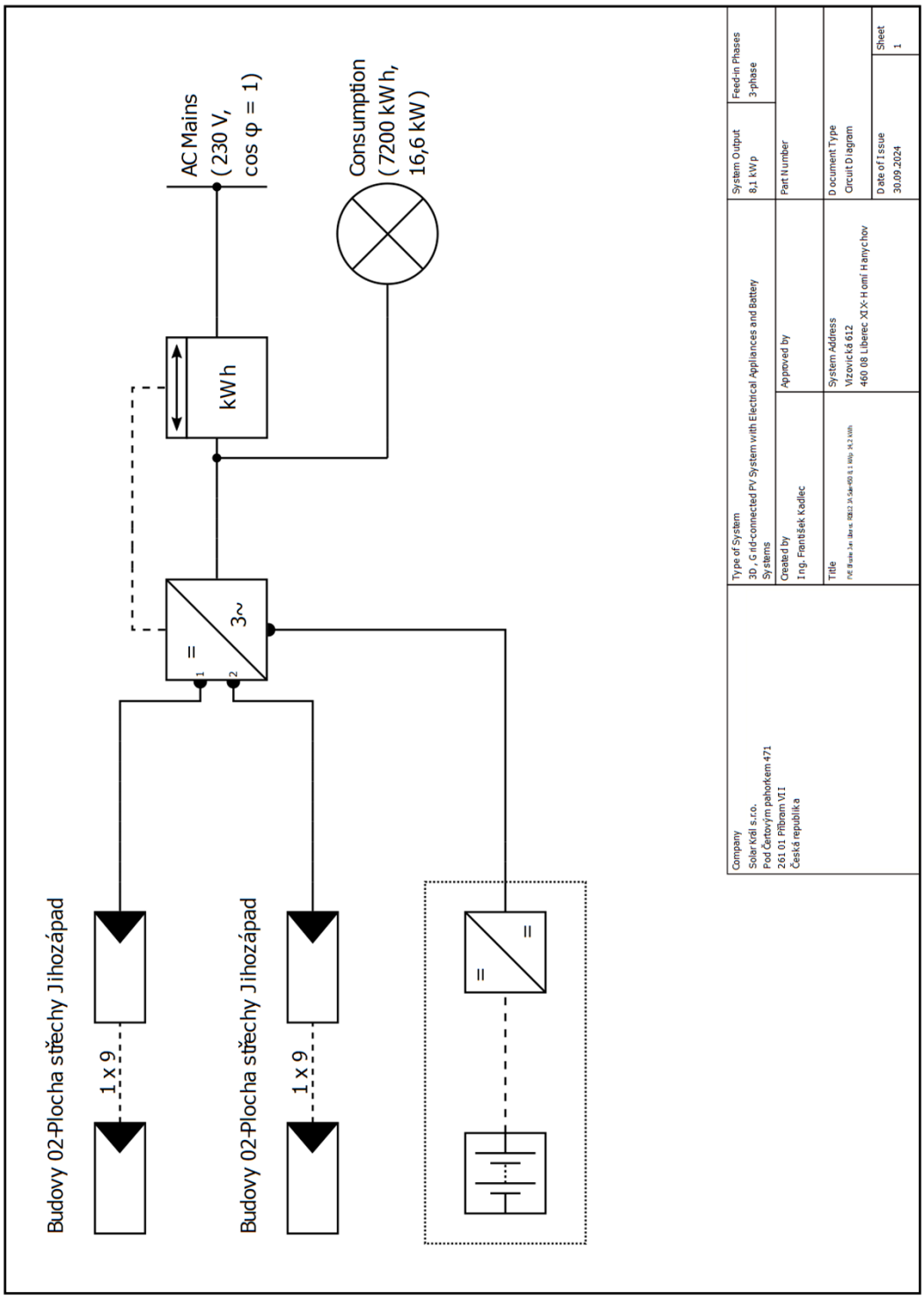


Figure: Circuit Diagram

Overview plan

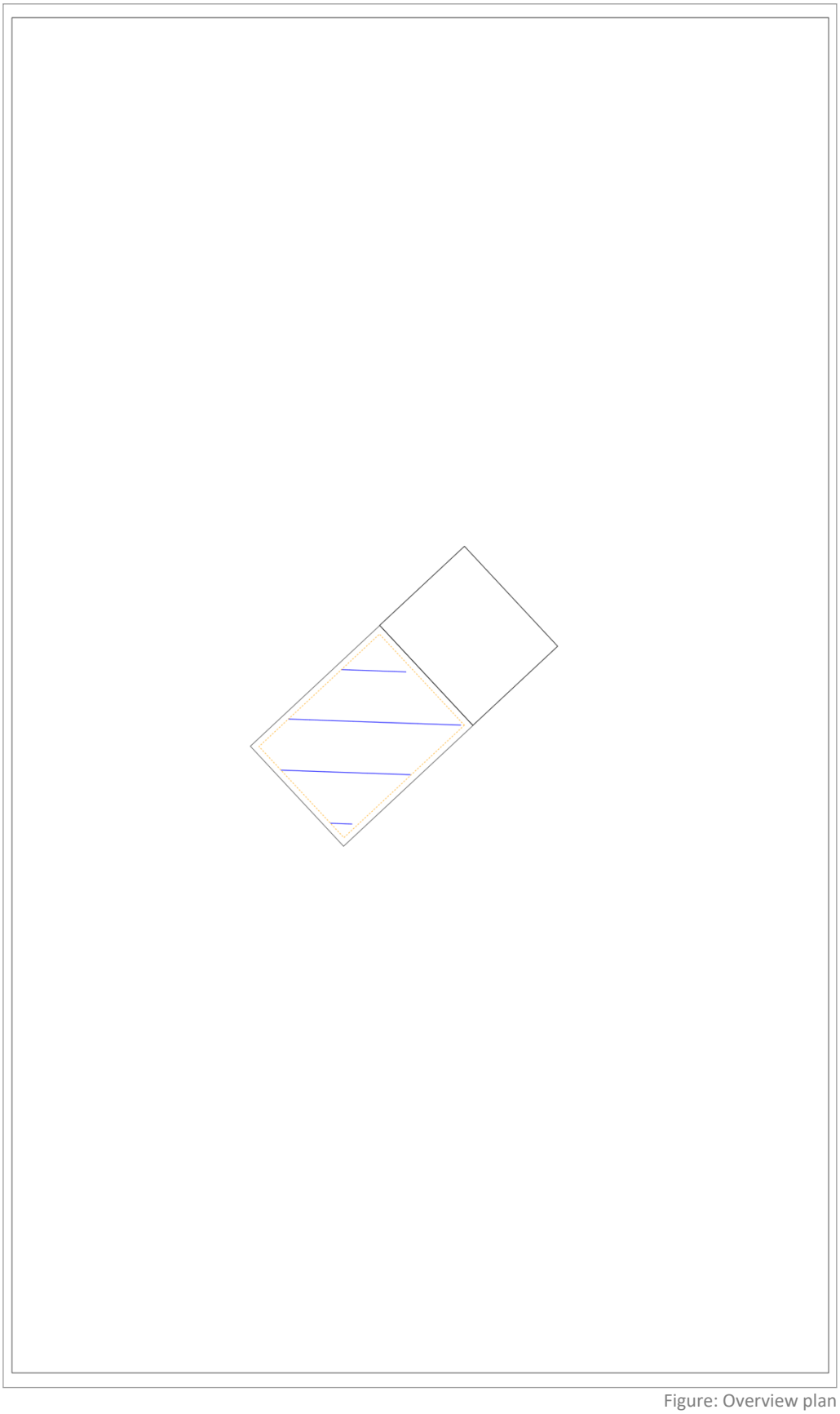


Figure: Overview plan

Dimensioning Plan

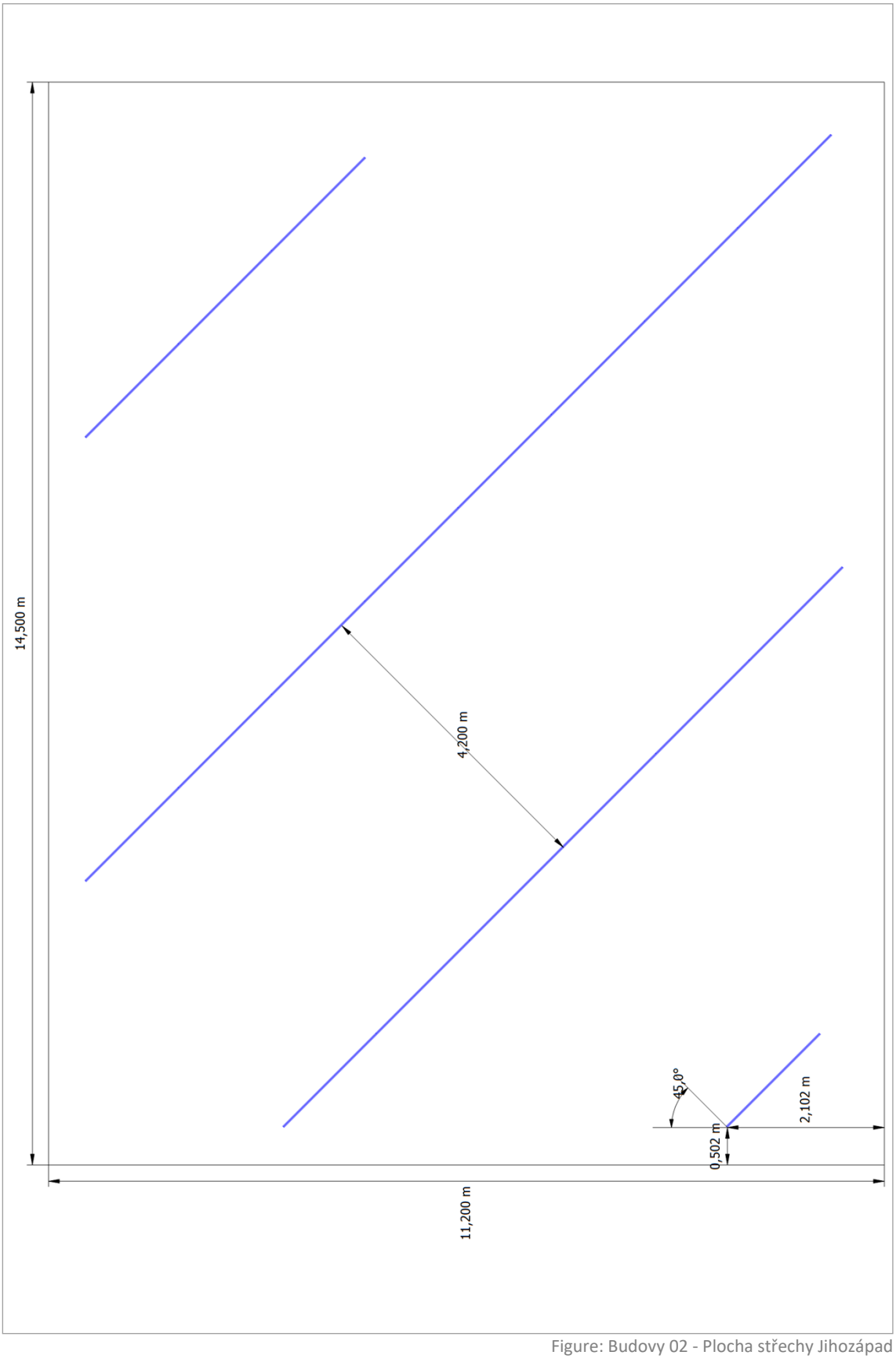


Figure: Budovy 02 - Plocha střechy Jihozápad

String Plan

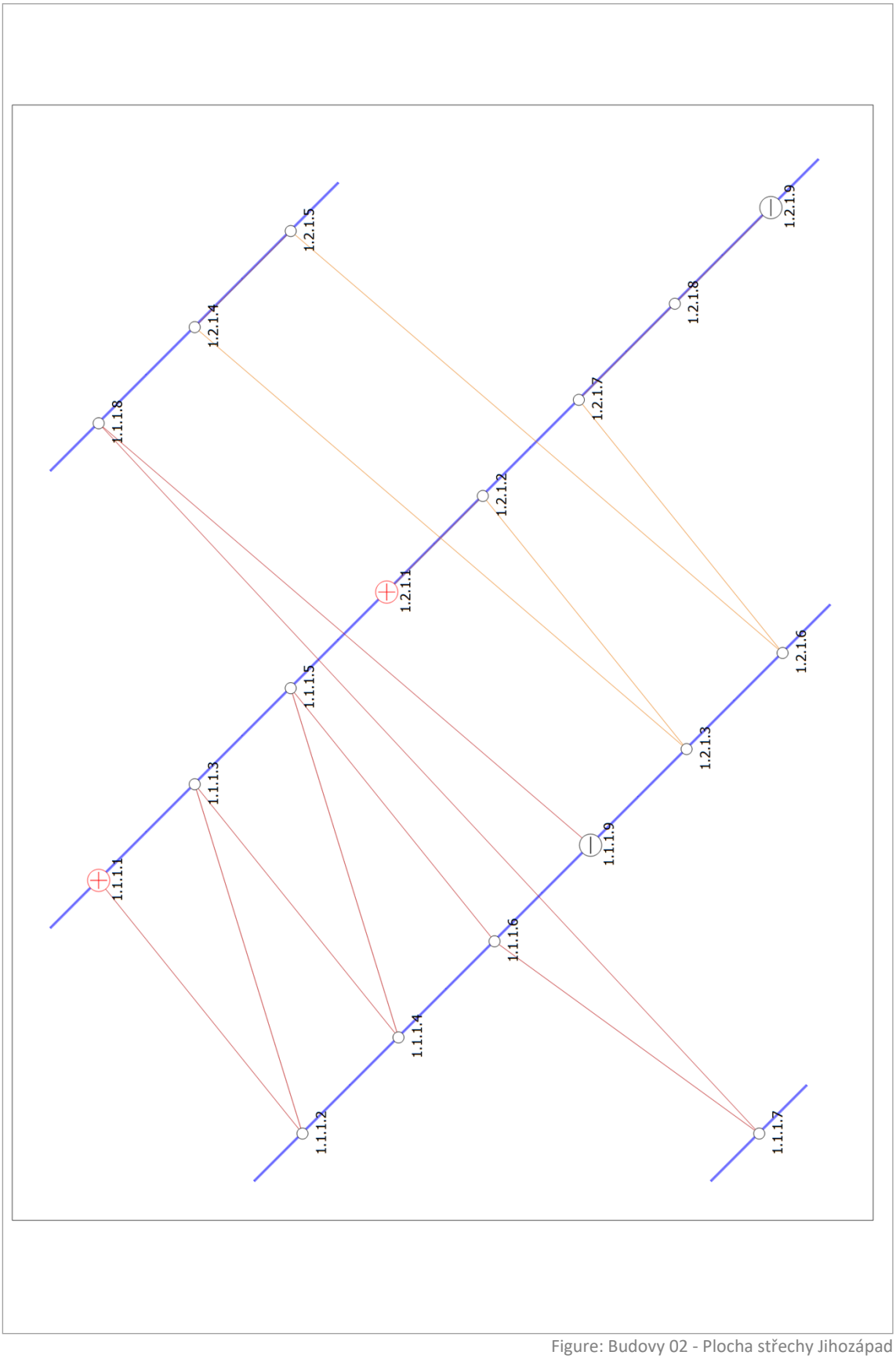


Figure: Budovy 02 - Plocha střechy Jihozápad

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		JA Solar Holdings Co., Ltd.	JAM54D40-450/LB	18	Piece
2	Inverter		GoodWe Technologies Co.,Ltd.	GW8KN-ET	1	Piece
3	Battery System		GoodWe Technologies Co.,Ltd.	GW8K-ET + Pylon Force H2 (14.20 kWh)	1	Piece
4	Components			Bidirectional meter with integrated dynamic feed-in control	1	Piece