Photovoltaic system

Nominal power equal to 7,8 kWp
Project name:
Residential home in Phoenix

Located in

Scottsdale
11001 N St Andrews Way

Customer

John Smith

11001 N St Andrews Way
85252 - Scottsdale (Arizona)

Economic report

Designer

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PURPOSE OF THIS DOCUMENT

The purpose of this report is the analysis of the economic aspects of the realization of a plant for production of electrical energy, with a power of 7,8 kWp, using photovoltaic conversion named Residential home in Phoenix, be built at the site in 11001 N St Andrews Way, Scottsdale.

1 - EXPLANATORY REPORT

1.1 - DESCRIPTION OF THE SYSTEM

The photovoltaic system is composed of n° 30 PV modules and n ° 1 inverters with a total nominal power of 7,8 kWp for an estimated annual production of energy equal to 14.063,56 kWh distributed over an area of 48,6 m² and a producibility of 1.803,02 kWh/kWp.
The connection to the grid will be carried out according to a scheme Three-phase in Low voltage with supply voltage 400,00 V.

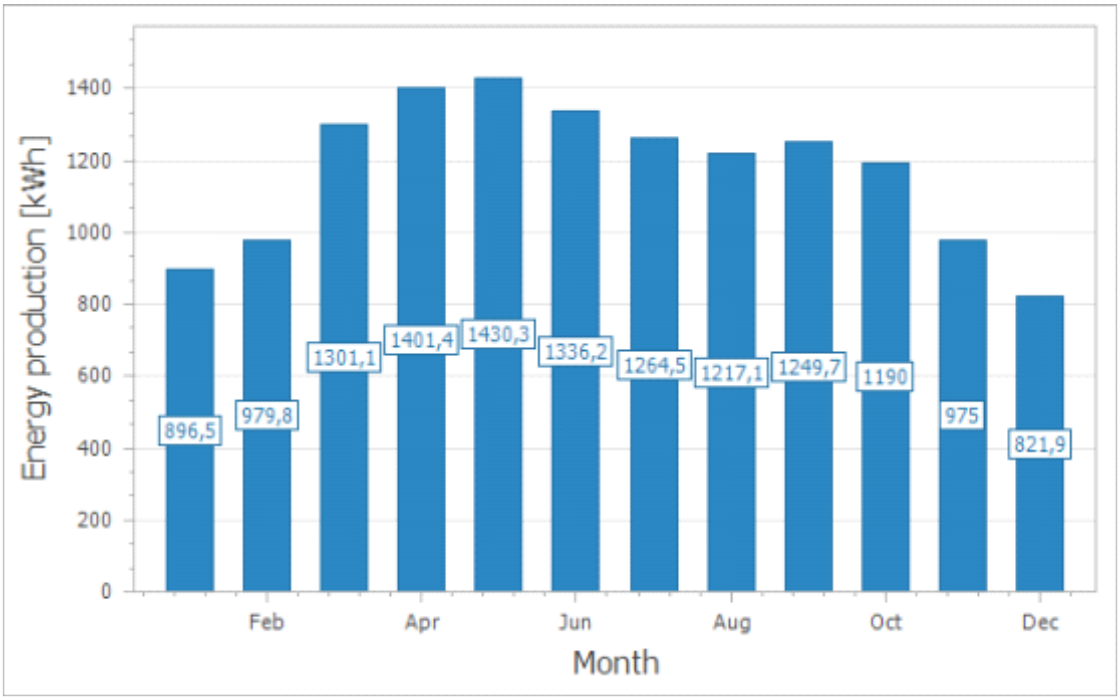
Characteristics of the system	
Nominal power	7,8 kWp
Number of PV modules	30
Total area modules	48,6 m²
Number of inverter	1
Estimated annual production of energy	14.063,56 kWh
Producibility	1.803,02 kWh/kWp
Connection to the grid	Three-phase in Low voltage
Voltage supply	400,00 V

Orientation strings #1	
Number of PV modules	15
Area modules	24,3 m²
Tilt	30,5°
Azimuth	179,325963032457°

Orientation strings #2	
Number of PV modules	15
Area modules	24,3 m²
Tilt	30,5146452157508°
Azimuth	179,325963032457°

1.2 - ENERGY PRODUCED

The energy produced by the plant on a yearly basis is 14.063,56 kWh, the following graph shows the energy produced on a monthly basis:



1.3 - Costs

The estimated costs for the realization of plant are listed below:

Costs of realization	
Total cost of the plant	€ 19.500,00
Specific cost	2.500,00 €/kWp

Furthermore we consider the periodic costs and extraordinary for maintenance of the system:

Periodic costs			
Description	**Period**	**Duration**	**Amount**
Service	1	20	€ 120,00
Insurance	1	20	€ 350,00
Total periodic costs			€ 9.400,00

Extraordinary costs		
Description	**Year**	**Amount**
Inverter replacement	10	€ 850,00
Total extraordinary costs		€ 850,00

1.4 - Energy consumption

The data required for the analysis of energy consumption are defined below:

Consumptions	
Total annual consumption	3.353,83 kWh
Average cost of electricity withdrawn	0,15 €/kWh
Share of self-consumption	20,37%
Annual increase of consumption	2,00%

1.5 - REVENUES

The data required for the analysis of revenues are defined below:

Nominal power	7,8 kW
Estimated annual production of energy	14.063,56 kWh
Energy self-consumed annually	20,37%
Annual loss of system efficiency	0,70%
Total annual consumption	3.353,83 kWh
Annual increase of consumption	2,00%

Financing	
Capital to finance	€ 15.600,00
Term	10 years
Loan interest	6,00%
Frequency installment	Annual
Installment amount	€ 2.119,54
Global financing:	**€ 21.195,40**

2 - Economic analysis

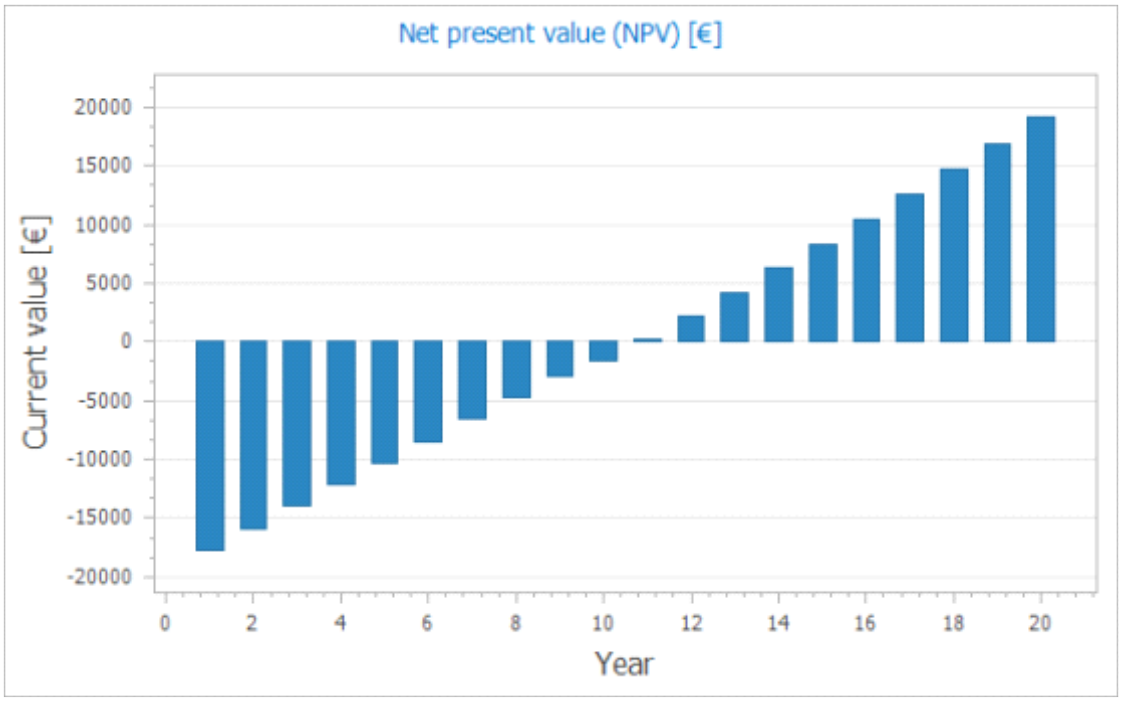
For economic analysis were considered the following rates:

Inflation	2,00%
Energy price inflation	6,00%
Discount rate	4,00%

The number of years required to return the initial investment through positive annual cash flow is: 11,5 years. The overall gain of the investment is: € 34.155,35.

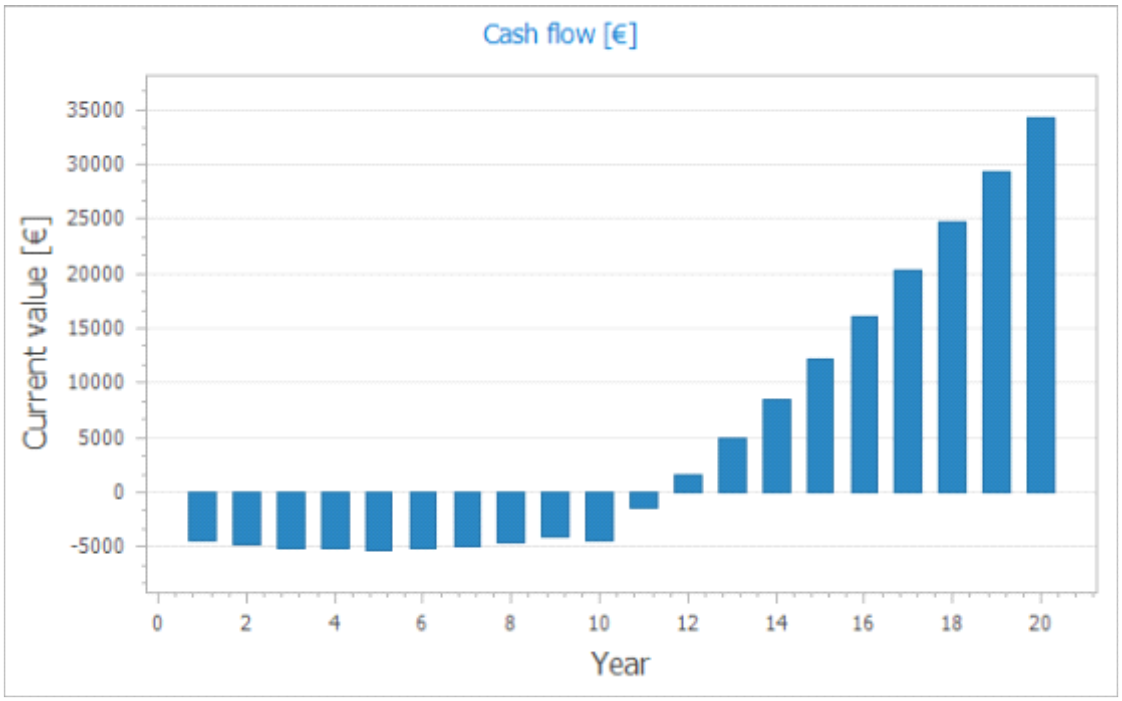
2.1 - ECONOMIC INDICATORS

2.1.1 - Net present value (NPV)



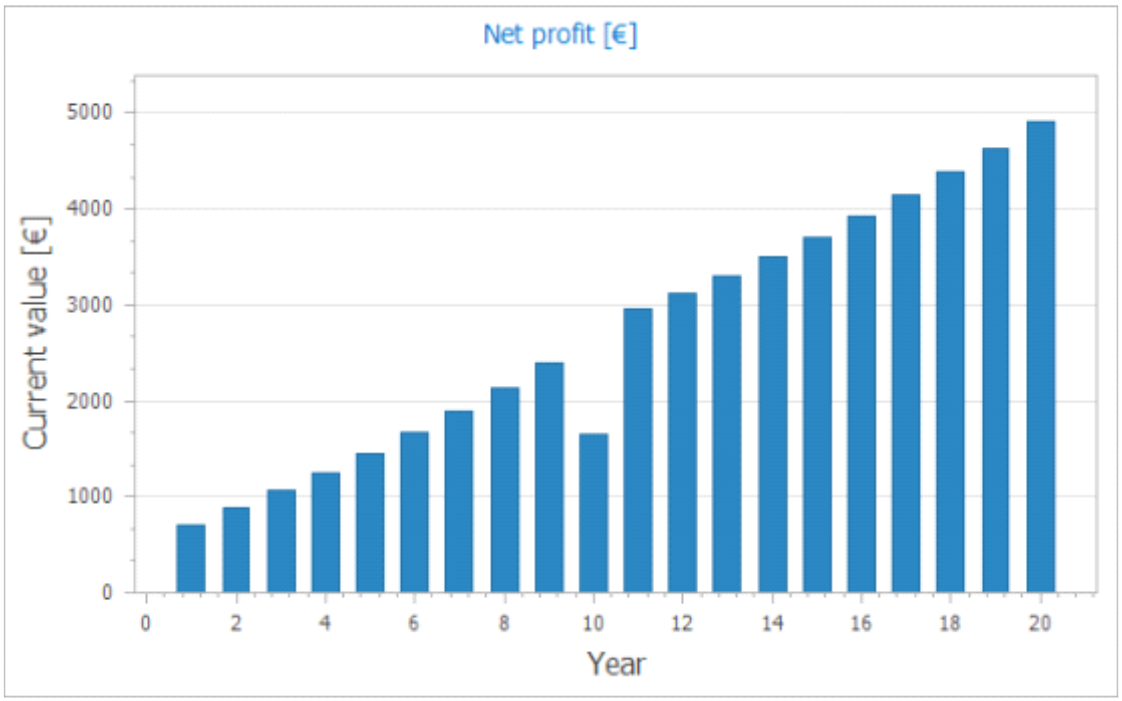
Net present value

2.1.2 - Cash flow



Cash flow

2.1.3 - Net profit



Net profit

2.2 - ECONOMIC ANALYSIS TABLE

Economic analysis table									
Year	Production [kWh]	Energy fed to grid [kWh]	Energy consumption [kWh]	Self-consumption [kWh]	Energy purchase tariff [€/kWh]	Energy taken from grid [kWh]	Revenue from net metering [€]	Revenue from energy sale [€]	Total revenue [€]
1	14.063,56	11.198,77	3.353,83	2.864,79	0	489,04	0	1.679,82	1.679,82
2	13.965,12	11.063,48	3.420,91	2.901,64	0	519,27	0	1.759,09	1.759,09

3	13.867,36	10.928,41	3.489,32	2.938,95	0	550,37	0	1.841,87	1.841,87
4	13.770,29	10.793,54	3.559,11	2.976,75	0	582,37	0	1.928,29	1.928,29
5	13.673,90	10.658,87	3.630,29	3.015,03	0	615,27	0	2.018,49	2.018,49
6	13.578,18	10.524,38	3.702,90	3.053,80	0	649,10	0	2.112,60	2.112,60
7	13.483,13	10.390,06	3.776,96	3.093,07	0	683,89	0	2.210,77	2.210,77
8	13.388,75	10.255,90	3.852,50	3.132,85	0	719,65	0	2.313,16	2.313,16
9	13.295,03	10.121,89	3.929,55	3.173,14	0	756,41	0	2.419,91	2.419,91
10	13.201,96	9.988,02	4.008,14	3.213,94	0	794,19	0	2.531,18	2.531,18
11	13.109,55	9.854,28	4.088,30	3.255,27	0	833,03	0	2.647,13	2.647,13
12	13.017,78	9.720,65	4.170,07	3.297,14	0	872,93	0	2.767,90	2.767,90
13	12.926,66	9.587,12	4.253,47	3.339,54	0	913,93	0	2.893,68	2.893,68
14	12.836,17	9.453,69	4.338,54	3.382,49	0	956,05	0	3.024,61	3.024,61
15	12.746,32	9.320,33	4.425,31	3.425,98	0	999,32	0	3.160,86	3.160,86
16	12.657,09	9.187,05	4.513,81	3.470,04	0	1.043,77	0	3.302,60	3.302,60
17	12.568,49	9.053,83	4.604,09	3.514,67	0	1.089,42	0	3.449,99	3.449,99
18	12.480,52	8.920,65	4.696,17	3.559,87	0	1.136,31	0	3.603,19	3.603,19
19	12.393,15	8.787,51	4.790,10	3.605,65	0	1.184,45	0	3.762,38	3.762,38
20	12.306,40	8.654,39	4.885,90	3.652,01	0	1.233,88	0	3.927,71	3.927,71

Economic analysis table

Year	Revenue of feed-in tariff on energy produced [€]	Revenue of feed-in tariff on energy fed into grid [€]	Revenue of feed-in tariff on energy self-consumed [€]	Saving on energy bill [€]	Maintenance costs [€]	Financing [€]	Loan capital amount [€]	Loan interest amount [€]	Gross profit [€]
1	0	0	0	429,72	470,00	2.119,54	1.183,54	936,00	0
2	0	0	0	461,36	479,40	2.119,54	1.254,55	864,99	0
3	0	0	0	495,33	488,99	2.119,54	1.329,83	789,71	0
4	0	0	0	531,80	498,77	2.119,54	1.409,62	709,92	0
5	0	0	0	570,96	508,74	2.119,54	1.494,19	625,35	0
6	0	0	0	613,00	518,92	2.119,54	1.583,84	535,70	0
7	0	0	0	658,14	529,30	2.119,54	1.678,87	440,67	0
8	0	0	0	706,60	539,88	2.119,54	1.779,61	339,93	0
9	0	0	0	758,62	550,68	2.119,54	1.886,38	233,16	0
10	0	0	0	814,48	1.577,52	2.119,54	1.999,57	119,97	0
11	0	0	0	874,46	572,93				0
12	0	0	0	938,84	584,39				0
13	0	0	0	1.007,97	596,07				0
14	0	0	0	1.082,19	608,00				0
15	0	0	0	1.161,87	620,16				0
16	0	0	0	1.247,42	632,56				0
17	0	0	0	1.339,27	645,21				0
18	0	0	0	1.437,89	658,11				0

19	0	0	0	1.543,76	671,28				0
20	0	0	0	1.657,43	684,70				0

Economic analysis table									
Year	Total tax [€]	Income subject to tax [€]	Taxable income [€]	Depreciation [€]	Tax detraction [€]	Net profit [€]	Cash flow [€]	Cumulative cash flow [€]	Net present value (NPV) [€]
1	0	0	0	0	0	703,53	-480,01	-4.380,01	-17.680,52
2	0	0	0	0	0	876,07	-378,49	-4.758,49	-15.854,90
3	0	0	0	0	0	1.058,50	-271,32	-5.029,82	-14.022,28
4	0	0	0	0	0	1.251,40	-158,21	-5.188,03	-12.181,88
5	0	0	0	0	0	1.455,36	-38,84	-5.226,87	-10.332,92
6	0	0	0	0	0	1.670,99	87,14	-5.139,72	-8.474,64
7	0	0	0	0	0	1.898,95	220,08	-4.919,65	-6.606,31
8	0	0	0	0	0	2.139,94	360,34	-4.559,31	-4.727,22
9	0	0	0	0	0	2.394,70	508,32	-4.050,99	-2.836,69
10	0	0	0	0	0	1.648,17	-351,40	-4.402,39	-1.620,31
11	0	0	0	0	0	2.948,65	2.948,65	-1.453,73	295,07
12	0	0	0	0	0	3.122,36	3.122,36	1.668,62	2.245,29
13	0	0	0	0	0	3.305,57	3.305,57	4.974,20	4.230,53
14	0	0	0	0	0	3.498,80	3.498,80	8.473,00	6.251,00
15	0	0	0	0	0	3.702,58	3.702,58	12.175,57	8.306,91
16	0	0	0	0	0	3.917,46	3.917,46	16.093,03	10.398,48
17	0	0	0	0	0	4.144,05	4.144,05	20.237,08	12.525,92
18	0	0	0	0	0	4.382,97	4.382,97	24.620,05	14.689,48
19	0	0	0	0	0	4.634,86	4.634,86	29.254,91	16.889,38
20	0	0	0	0	0	4.900,43	4.900,43	34.155,35	19.125,87

2.2.1 - DEFINITIONS OF ECONOMIC ANALYSIS TABLE

Production [kWh]: Energy production estimated by the program. Also matches the Energy fed to grid + Self-consumption.

Energy fed to grid [kWh]: Energy produced by the system and fed into the grid because not consumed by users of the PV system.

Energy consumption [kWh]: Annual energy consumption, including any increases in consumption. Also matches *Self-consumption + Energy taken from the grid*.

Self-consumption [kWh]: The amount of energy produced by the system and at the same time consumed by the users of system.

Energy taken from grid [kWh]: Energy consumed by the user and

coming from the grid.

Revenue of feed-in tariff on energy produced [€]: Energy produced * Feed-in tariff for the produced energy.

Revenue of feed-in tariff on energy fed into grid [€]: Energy fed into grid * Feed-in tariff for energy fed to the grid.

Revenue of feed-in tariff on energy self-consumed [€]: Energy self-consumed * Feed-in tariff for self-consumed energy.

Revenue from energy sale [€]: Energy fed into grid * sale price.

Total revenue [€]: Revenu of feed-in tariff + Revenue from energy sale.

Energy purchase tariff [€/kWh]: Energy purchase tariff revalued annually by the Energy price inflation.

Saving on energy bill [€]: Savings due to non-purchase of energy. Calculated as Self-consumption * Energy purchase tariff.

Maintenance costs [€]: Cost of maintenance periodic and extraordinary.

Depreciation [€]: Depreciation of the system, calculated for each year as the Realization cost * System depreciation * Annual Depreciation.

Financing [€]: Amount of annual installment with financing. The amount is calculated by the program based on the capital to be financed. Also, matches Loan capital amount + Loan interest amount.

Loan capital amount [€]: Principal portion of the installment loan.

Loan interest amount [€]: Interest portion of the installment loan.

Gross profit [€]: Total revenue + Saving on energy bill + Tax detraction - Maintenance costs - Depreciation - Loan interest amount.

Total tax [€]: Taxable income * Tax rate for income.

Income subject to tax [€]: Part of the Total revenue subject to tax.

Taxable income [€]: Refers to the basis upon which an income tax system imposes the taxes, calculated for each year as Income subject to tax - Maintenance costs - Depreciation. Note that the program does not handle tax credits, so if Taxable income is negative then Total tax will be forced to zero.

Tax detraction [€]: Amount to detract by annual amount of tax, it is a percentage of the cost of the system divided into a period of years.

Net profit [€]: Gross profit - Total tax.

Cash flow [€]: Net profit + Depreciation - Loan capital amount.

Cumulative cash flow [€]: cash flow of year + cash flow of previous year. The first year is calculated as: cash flow of year - system cost + amount to be financed.

Net present value (NPV) [€]: By calculating the NPV is established the convenience expected of investment, by discounting the future cash flows to detect the present value of the investment.