

Solar Carports

Sopago GmbH
Munich



***We generate environmentally friendly
electricity and protect vehicles***

SOPAGO

your supplier
for solar carport

- Supplier for a modular solar carport system for sealed parking areas from 35 Parking Spaces.
- For companies, retail, cities and municipalities for environmentally friendly power generation where it is needed.
- Our goal is to provide the energy turn around with a new building block for sealed surfaces to add.
- Our team combines a future-oriented vision with broad engineering knowledge and experience in solar implementations and their operation.

Strong increase in demand for solar carports

Challenges

Ambitious expansion targets for solar energy in order to achieve the goal of a balanced greenhouse

Rising prices and uncertainty in the electricity market

Legal requirements for the use of Photovoltaics on sealed surfaces, especially for new projects

Limited availability of land for construction of photovoltaic plants

Sopago solution



Our solution: functional solar parking lots



- Modular solution with solar carports for 2, 3, 4, 6 and 8 parking spaces that can be expanded **many times over**
- **High yields** and flexible orientation due to east-west gable roof shape and bifacial solar modules
- Durable, **high-strength construction** made of hot-dip galvanized steel and glued laminated beams
- Connection of solar power plant to power consumers, on-site domestic grid, feeding surplus from PV plant into public grid.

Our solution: The benefits for you



- Dry shaded parking areas, **protect the vehicles** from the effects of the weather.
- High snow bearing capacity and wind resistance enables use in almost all weather regions in of Germany.
- With the direct consumption of the solar power generated expensive purchase of grid electricity is reduced.
- Installation of charging stations for cars and eBikes is prepared.

Flexibility and fast construction



- Flexible parking modules enable the maximum use of the parking space for environmentally friendly power generation.
- Suitable for existing and new parking lots because the system can be adapted to different parking space widths and heights (while minimizing minimization of earthworks).
- Short construction time, quick assembly due to innovative foundations, prefabricated construction and cable management system.

Attractive environmentally friendly investment

- Attractive price due to standardized modular construction, thus short payback period and high return on investment.
- With 100 solar parking spaces, savings of 1,450 t CO₂ in 20 years (compared to the German electricity mix).
- Sustainable solution made of steel and wood (no concrete, almost no aluminum)
- High efficiency due to gable roof shape and bifacial solar modules (efficiency over 20%).
- Roof shape enables evenly distributed power generation throughout the day distributed power generation over the day (approx. 12.2 kWp for 4 pitches result in 10,000 - 12,000 kWh per year).
- Low maintenance and operating costs due to self-cleaning roof shape and high quality & stable solar modules.

Example cost - benefit calculation for one parking space

100 parking spaces with solar carports

Basis use of solar modules with 480 Wp, electricity price in the amount of 30 cents and 100% self-consumption

1. Step - Realization planning of the plant and approval	26.000 €
2a. Step - Setting the foundations including soil testing	73.000 €
2b. Step - Construction of the carports incl. cabling DC-side	802.000 €
Total investment of the SOPAGO system net without VAT .	901.000 €
Number of solar carport pitches	100
Price per solar carport and parking space	9.010 €
System output in kWp (for example 480 Wp per module)	360
Power generation per year in kWh per kWp	950
Total annual output in kWh	342.000
Price per kWp	2.503 €

Assumptions:

- Share of own consumption of solar power 100%
- Electricity generation in central Germany (950 kWh per year and kWp)
- Current electricity costs are 30 cents per kWh, increase 2% per year
- Annual operating costs 6,000 Euro per year, increase 2% per year
- Operating life 25 years, book value after 20 years 0 Euro
- Costs for planning and connection AC-sided to power supplier are not included in calculation

Year	Costs for one-time construction and ongoing operation	Profits from own consumption Electricity	Difference at the end of the year
1	907.000 €	102.600 €	-804.400 €
2	6.120 €	104.652 €	-705.868 €
3	6.242 €	106.051 €	-606.059 €
4	6.367 €	107.469 €	-504.957 €
5	6.495 €	108.906 €	-402.546 €
6	6.624 €	110.362 €	-298.808 €
7	6.757 €	111.838 €	-193.728 €
8	6.892 €	113.333 €	-87.287 €
9	7.030 €	114.848 €	20.531 €
10	7.171 €	116.384 €	129.744 €
11	7.314 €	117.940 €	240.370 €
12	7.460 €	119.517 €	352.426 €
13	7.609 €	121.114 €	465.931 €
14	7.762 €	122.734 €	580.903 €
15	7.917 €	124.375 €	697.361 €
16	8.075 €	126.038 €	815.323 €
17	8.237 €	127.723 €	934.809 €
18	8.401 €	129.430 €	1.055.838 €
19	8.569 €	131.161 €	1.178.430 €
20	8.741 €	132.914 €	1.302.603 €
21	8.916 €	134.692 €	1.428.379 €
22	9.094 €	136.492 €	1.555.778 €
23	9.276 €	138.317 €	1.684.819 €
24	9.461 €	140.167 €	1.815.524 €
25	9.651 €	142.041 €	1.947.914 €
Summ	1.093.182 €	3.041.096 €	
Total profit minus Total costs		1.947.914 €	

Example for yield calculation of electricity and charging points

Yield calculation* based on the given data with complete self-consumption of electricity	
Number of charging points	15
Ø Sale kWh per charging point per day	30
Purchased electricity in kWh of charging points p.a.	164250
Sales price per kWh at charging point	0,49 €
Subtotal revenue charging points p.a.	30.780 €
GHG premium** (as of 09/2022) approx. 0.20 €/kWh	32.850 €
Savings by using electricity of the solar carpports at an assumed electricity purchase price of 0,30 €/kWh	102.600 €
Total revenue p.a.	166.230 €

- * This is an estimate.
 - An exact calculation is possible after availability availability of all data.
 - The prices indicated are net totals.
- ** Following notes:
 - Explanation of GHG premium on page 13.
 - The assumption is based on the use of 100% green electricity from the grid and 0% self-generated solar electricity, which is directly transported directly to the charging points.
 - Attention: The GHG premium is subject to fluctuations and changes in the future.
- *** Assumed utilization of the parking lot during the day at day at 50%.
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Economic efficiency calculation

Profitability calculation* of the investment based on based on the assumed data	
Investment solar carport incl. DC-side connection	901.000,- €
Production of 15 charging points incl. Billing system - estimated	52.500,- €
Investment sum	953.500,- €

The payback period for the Sopago system with charging points is therefore 5 years and 8 months (return on investment 17.43%) with estimated parameters.

Investments in AC and civil engineering civil are not considered

*This is a rough estimate. An exact calculation is possible after availability of offers and further data.
Basis of estimation: See page 17 - Indication of costs to connect AC power side.
Ancillary costs for maintenance and billing systems were not calculated.

Explanation of GHG (greenhouse gas reduction) Quota / Premium

The greenhouse gas reduction quota (also greenhouse gas quota, greenhouse ratio or GHG quota) is a market-based climate protection instrument that has been standardized by law in Germany since 2015. To introduce more renewable energies into the transport sector and thereby reduce climate-damaging greenhouse gas emissions. The GHG quota will gradually increase from 7% in 2022 to 25% in 2030. As of January 1, 2022, owners of battery-only vehicles can receive money through the GHG quota for the CO₂ emissions saved ("GHG premium").

In addition, **charging point operators** - from small businesses to large corporations - can generate revenue through their (semi) public charging infrastructure can generate income from the GHG premium of currently up to 0.35 €/kWh (with their own renewable energy production). Realistically, if supplied with green electricity, already additional 0.20 € per kWh charged at the charging station in addition to the normal charging fee (as of 09/2022).

Alternatively we offer a rental option

Example 100 parking spaces

Two alternatives for rental contract*

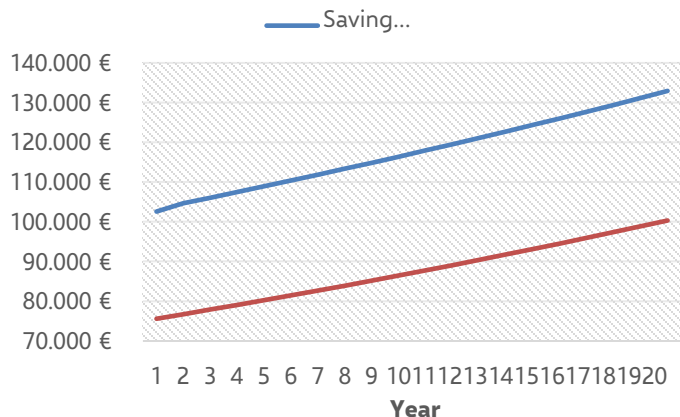
Investment amount	901.000	EUR
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Contract period	15 Jahre		Contract period	20 Jahre	
Monthly rent	7.450 EUR	74,50 EUR per parking space	Monthly rent	6.300 EUR	63,00 EUR per parking space
Annual rent	89.400 EUR	894,00 EUR per parking space	Annual rent	75.600 EUR	756,00 EUR per parking space

* Details and assumptions:

- Subject to a credit check by our principal bank
- Rental price is subject to annual contractual price adjustment based on general inflation index
- The tenant receives for rent the solar carports with PV and inverter
- The tenant can use 100% of the electricity himself
- As a security easement on parking lot will be registered
- The cost of AC connection is paid by the tenant
- Service contract and insurance for the solar carport must be taken out separately by the tenant

History of rent and electricity cost savings for a parking area with 100 parking spaces



Assumptions:	
• Share of own consumption of electricity	100 %
• Electricity price energy supplier in the 1st year	30 Cent
• Energy cost increase per year	2 %
• Reduction of solar yield per year	0,05 %
• Price adjustment rent based on inflation rate	1,5 %

Year	Saving electricity purchase	Annual rent (20 years)	Profit
1	102.600 €	75.600 €	27.000 €
2	104.652 €	76.734 €	27.918 €
3	106.051 €	77.885 €	28.166 €
4	107.469 €	79.053 €	28.416 €
5	108.906 €	80.239 €	28.667 €
6	110.362 €	81.443 €	28.919 €
7	111.838 €	82.664 €	29.173 €
8	113.333 €	83.904 €	29.429 €
9	114.848 €	85.163 €	29.685 €
10	116.384 €	86.440 €	29.943 €
11	117.940 €	87.737 €	30.203 €
12	119.517 €	89.053 €	30.464 €
13	121.114 €	90.389 €	30.726 €
14	122.734 €	91.745 €	30.989 €
15	124.375 €	93.121 €	31.254 €
16	126.038 €	94.518 €	31.520 €
17	127.723 €	95.935 €	31.787 €
18	129.430 €	97.374 €	32.056 €
19	131.161 €	98.835 €	32.326 €
20	132.914 €	100.317 €	32.597 €
Sum	2.349.388 €	1.748.149 €	601.238 €

Our bifacial glass-glass modules

Alternatives

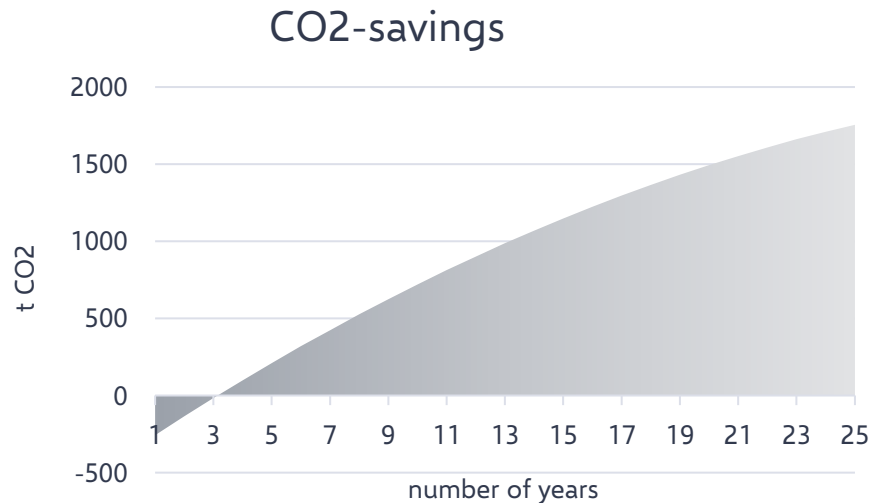
Model	Power [Wp]	Light transmittance	Length [mm]	Carport Roof length [m]
AE Solar Comet	480	not translucent	2094	6,50
	400	not translucent	1755	5,50
AE Solar Aurora	440	slightly translucent	2094	6,50
	370	slightly translucent	1755	5,50
Solarwatt Vision 60M	310	translucent	1680	5,25



Estimation of CO2 emissions for a parking lot with 100 parking spaces

Comparison with electricity mix in Germany

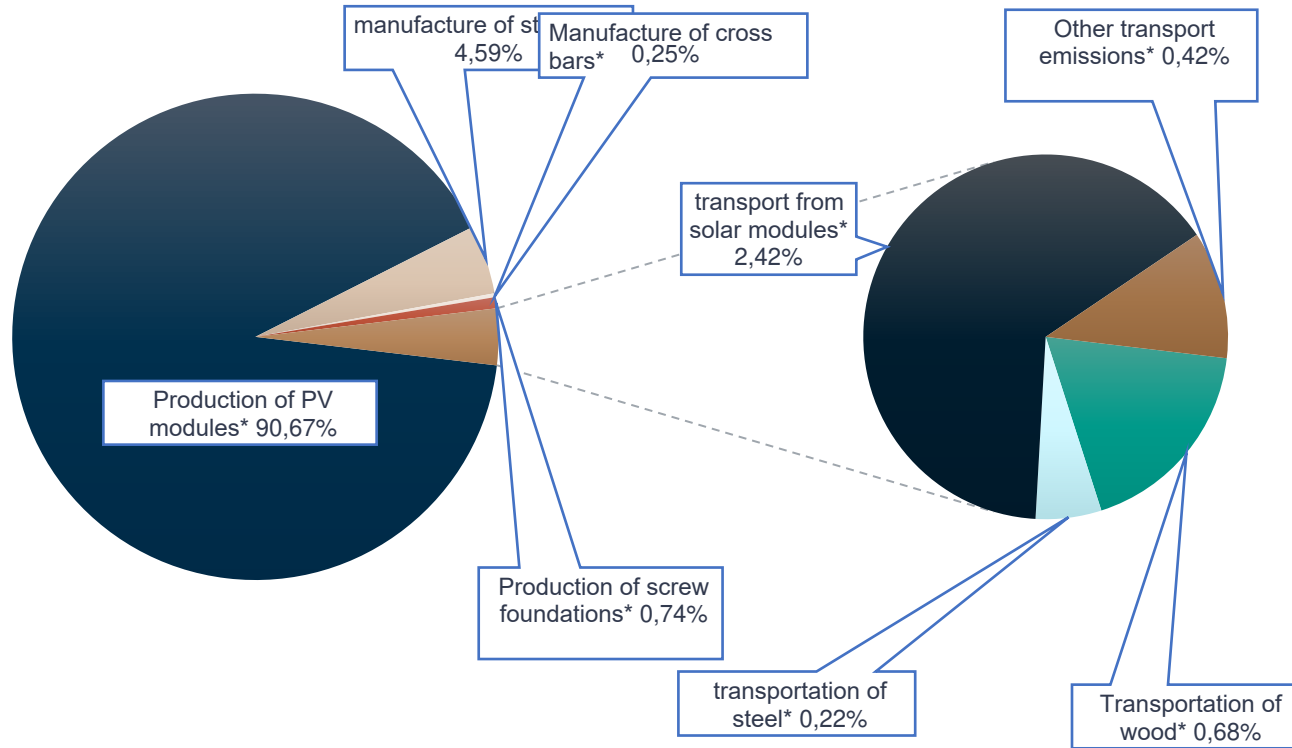
- **CO2 savings in the first year: 125 t**
- **Net CO2 savings over 25 years: 1,756 t**
- **CO2 net saving from the 4th year onwards**



History of CO2 emissions			
year	CO2 emission [for production [t]	CO2 savings by generation eco-current [t]	Netto CO2 saving on end of the year [t]
1	382	125	-257
2	0	122	-136
3	0	119	-17
4	0	115	98
5	0	112	210
6	0	109	319
7	0	105	424
8	0	102	526
9	0	99	625
10	0	95	720
11	0	92	812
12	0	89	901
13	0	86	987
14	0	82	1069
15	0	79	1148
16	0	76	1224
17	0	72	1296
18	0	69	1365
19	0	66	1431
20	0	62	1493
21	0	59	1552
22	0	56	1608
23	0	53	1661
24	0	49	1710
25	0	46	1756
In total	382	2138	1756

* Taking into account the production of the individual components and their transport to the customer

CO₂-Emission for 100 pitches



E-cars and solar parking

- Prepared for installation of charging stations (wallboxes) for e-cars
- Solar surplus energy direct use through intelligent control
- Optimized for high charging power
- High efficiency due to gable roof shape, that enables evenly distributed power generation throughout the day

Attract the attention of customers and employees with solar parking

Our product is a key driver for increasing customer loyalty and a decisive advantage over competitors:

- High attractiveness of parking areas for customers and employees.
- Parking spaces are shaded and dry, at the same time bright due to bifacial solar panels.
- Prepared for installation of charging stations for e-cars and e-bikes.
- Publicly generate environmentally friendly solar power and save on CO₂.
- Ecological materials allow complete recycling.

Optional: Realization concept before planning phase (Germany)

Target: Transparency for the possible implementation of the project

We create a realization concept for you with the following components:

- Examination of the approvability of the project and possible restrictions due to local conditions
- Obtaining the following documents: Development plan, excerpt from the land register of the building plot and ownership of neighbors.
- Design plan for PV parking lot canopy considering shading and spacing regulations.
- Preparation of preliminary building application form, site plan, elevations and open space plan.
- Request network test from energy supplier
- Analysis of the main consumers and load profile
- Self-consumption analysis with PVSol software
- PV module planning and mass determination
- Feed-in concept considering the current EEG regulation
- Estimation of CO2 savings for the plant (CO2 savings minus CO2 emissions for the construction of the carports)
- Depreciation concept for solar carport system

Price (up to 100 pitches): 4,800 euros net

Will be credited when commissioning the planning phase

With the result you can (gladly with our support):

- Submit building application
- Request promotion
- Submit financing request
- Get clarity on utility restrictions and costs
- Significantly accelerate the construction project

For this we need from you:

- Power of attorney of the owner of the land plot for obtaining the documents
- Current open space plan
- Electricity load profile / load profile

Why solar parking is important now

Baden-Württemberg plant Photovoltaik-Pflicht auch für neue Parkplätze

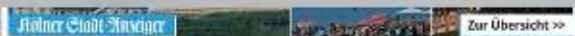
Die Landesregierung hat jetzt den Entwurf des Klimaschutzgesetzes zur Anhörung freigegeben. Es sieht unter anderem vor, dass auf neuen Nicht-Wohngebäuden sowie über Parkplatzflächen ab 2022 Photovoltaik-Anlagen installiert werden müssen.

pv magazine, 26.05.2020

Lidl setzt auf Photovoltaik

Der Lebensmittel-Discounter Lidl lässt in den Niederlanden seine erste Filiale ausschließlich mit Solarstrom versorgen.

Solarserver, 16.01.2020



Bedburg Grüne fordern Photovoltaik-Anlagen auf allen Parkplätzen im Stadtgebiet

Kölner Stadtanzeiger, 11.12.2020

ENERGIEGEWINNUNG

„Solar-Carports sind eine zukunftsweisende Lösung“

Kronen Zeitung, 06.01.2021

Schleswig-Holstein will Photovoltaik-Pflicht einführen

Schleswig-Holsteins Umweltminister Jan Philipp Albrecht (Grüne) will eine Photovoltaik-Pflicht in seinem Bundesland einführen. Im Zuge eines neuen Klimaschutz- und Energiewendegesetzes soll die Installation von Photovoltaik-Anlagen auf neuen Gewerbe- und Wohngebäuden vorgeschrieben werden.

ecoreporter, 10.09.2020

Rheinland-Pfalz baut seine „Solar-Offensive“ aus

14 Millionen Euro zusätzlich für Balkonmodule, Agro-Photovoltaik, Solar-Carports und Wallboxen.

Das Bundesland baut seine „Solar-Offensive“ aus. Die Photovoltaik-Speicher-Förderung läuft weiter und will künftig noch mehr fördern, um die Solarenergie als Wirtschaftsfaktor zu stärken.

SONNENSEITE, 02.10.2020

Two models: purchase and leasing

Purchase of the solar parking lot plant	Leasing of the solar parking lot system
<p>You are the owner and operator of the solar parking facility</p>	<p>As a lessee you are the operator of the solar parking facility</p>
<p>One-time investment, depreciation of investment costs over the life of the investment</p>	<p>Only low investment costs, cost transparency through predictable leasing fees</p>
<p>Electricity generation can be used by the customer or fed into the grid</p>	<p>Electricity generation can be used by the customer or fed into the grid</p>
<p>We take care of the planning, delivery and installation, and if desired, we can take over the complete maintenance and service.</p>	<p>Planning, installation, maintenance and service is completely taken over by us</p>

SOPAGO

Your provider for solar parking spaces

- Our goal is to add a new building block for sealed surfaces to the energy transition.
- Our team combines a forward-looking vision with broad engineering knowledge, tax optimization and experience in solar implementations and operations.
- SOPAGO uses its diverse experience to implement the legal requirements for renewable energies in parking lots. Through intelligent use of legal subsidy offers and tax optimization, you achieve a short-term amortization.

Contact us!



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Use the power of the sun!



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