

☀️ Feel the Power of the Sun ☀️

The sun as an energy source is the only reason for life on earth. Over time, humanity has begun to use these in a useful way. Solar as an energy source has become a trend in recent years. It can not only be used in an environmentally friendly way, but also reduces costs. In this small project, we focus on the electricity consumption of an average household and look at how costs can be reduced by using a solar system. However, the development is fascinating and we are curious to see what the future will bring us.

The past of Solar energy till 100 years ago

Solar energy has always been present throughout history. The sun as a source of energy has always been crucial for the development of life. Over time, humanity has improved strategies to use the sun in a useful way.

The Greeks were the first to consciously use passive solar energy. They built their houses with solar radiation in mind. This is also called bioclimatic architecture.

The Romans used glass for their windows for the first time. Through the glass, they used the sun's heat to keep their houses warm. They also built glass houses and greenhouses to create the best conditions for growing exotic plants.

Solar energy was also used as a weapon. Archimedes, for example, developed a military defense system made of mirrors. He erected large mirrors, concentrated the sun's rays on a specific point and destroyed several ships.

With the advent of fossil fuels, the solar industry lost importance. Solar energy was too expensive in comparison and was no longer supported as strongly in research.

Following a shortage of fossil fuels, solar energy regained importance. This scarcity had a great significance for further development.

There was a lot of experimentation and testing. Through numerous attempts and experiments, more and more opportunities for using the sun were discovered. This has brought us to the current era of solar energy use.

(solar-energy.technology, 2022)



[1] Archimedes military invention

Solar energy today

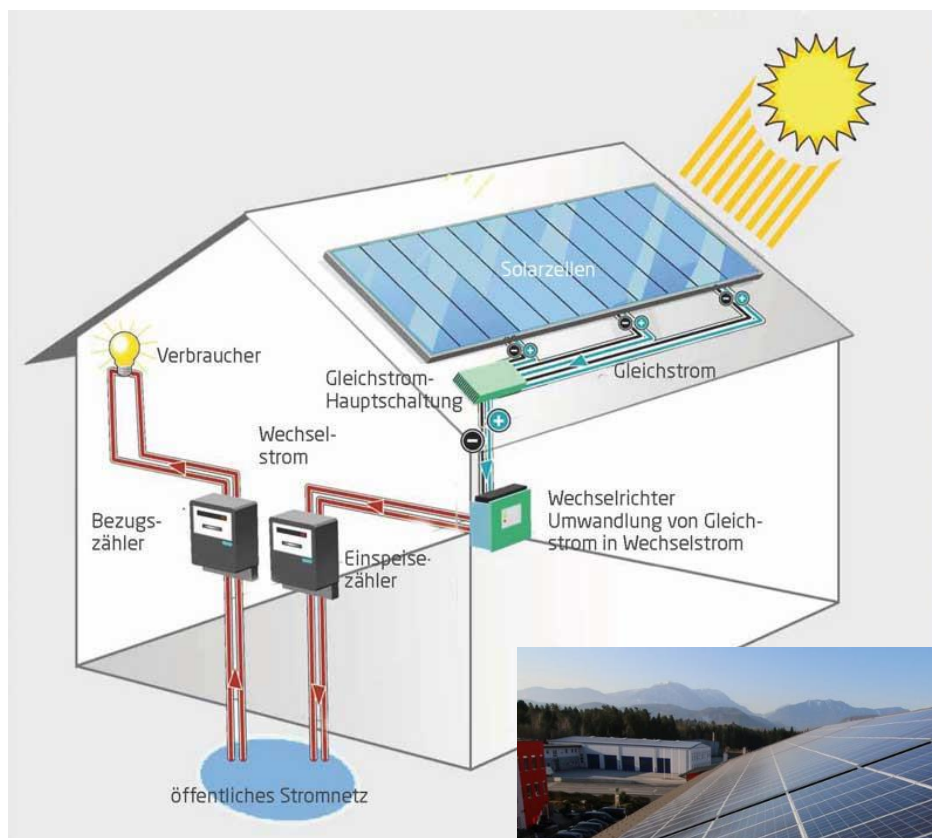
In contemporary times, it is the other way round. Attempts are being made to dispense with fossil fuels and to use solar energy instead. Compared to other countries, very little electricity is generated from solar energy in Switzerland today. However, solar energy has the greatest potential for expansion of all renewable energies.

Today, the two main methods of using solar energy are photovoltaic and solar thermal. Photovoltaic cells are made of silicon or other materials that convert sunlight directly into electricity. Solar systems generate electricity locally for homes and businesses, either through rooftop panels or through community projects that power entire neighbourhoods.

With a PV solar system today, the electricity is used immediately, stored in a solar battery or fed into the grid and credited on the electricity bill.

So, it's a smart way to save money while reducing dependence on non-renewable energy. Large companies and electricity suppliers in particular benefit from photovoltaic energy generation by installing large solar systems that can supply the company's operations.

(wikipedia, 2022) (wwf, 2022)



[2] Structure solar system

[3] Solar panels

Calculation

We assume: An average electricity consumption of a Swiss household. Our example is provided with a PV system with 8 panels on the south side of the house roof.

Initial situation / Given:

1 Photovoltaik Paneele = 300 Watt
n= 8 PV (Anzahl Paneelen)
Roof side: south

Daytime sun summer: t = 15h Ø
Efficiency (Wirkungsgrad): 65%
Daytime sun winter: t = 9h Ø
Efficiency (Wirkungsgrad): 45%

Consumption average household per year:

Power / current consumption: 15'000 kWh
Costs: CHF 2'500 -> 208.30 per month

Calculation: $W = p \times t$

Summer:

$8 \times 300 \text{ W} = 2400 \text{ W}$
 $2400 \text{ W} / 1000 = 2.4 \text{ kW}$

$2.4 \text{ kW} \times 15 \text{ h} = 36 \text{ kWh}$
 $36 \text{ kWh} / 100 \times 65 = 23.4 \text{ kWh}$

monthly: $W \times 30 \text{ d}$
 $23.4 \text{ kWh} \times 30 = 702 \text{ kWh}$

costs: $K = k \times W$
 $0.16 \times 702 \text{ kWh} = 112.32 \sim \text{CHF } 112.30$

Calculation $W = p \times t$

Winter:

$8 \times 300 \text{ W} = 2400 \text{ W}$
 $2400 \text{ W} / 1000 = 2.4 \text{ kW}$

$2.4 \text{ kW} \times 9 \text{ h} = 21.6 \text{ kWh}$
 $21.6 \text{ kWh} / 100 \times 45 = 9.72 \text{ kWh}$

monthly: $W \times 30 \text{ d}$
 $9.72 \text{ kWh} \times 30 = 291.6 \text{ kWh}$

costs: $K = k \times W$
 $0.16 \times 291.6 \text{ kWh} = \text{CHF } 46.65$

Saving costs per month:

Summer:

208.30 - 112.30 = **CHF 96**

Winter:

208.30 - 46.65 = **CHF 161.65**

Solar energy in 100 years

We think that solar energy will develop much further in the future. Especially again with the rising prices of fossil fuels and the increasing environmental pollution. The spread of PV systems will certainly increase even more in the next few years, because blackouts in the electricity grid are already being felt frequently. Self-sufficiency is also increasingly desired in order to be more independent. The future is uncertain, but solar energy will continue to accompany us, no matter in what form. Because as we have seen, it has been in use for several hundred years. As long as the sun shines, we will draw and use its energy.

Summary

We were most impressed by the historical aspect. I think that people often forget how long the sun has been used. It is also exciting to see how the principles have changed over the last hundred years. Because solar energy was first eclipsed by fossil fuels and now it is the shining future. In this way, the change in society and the personal attitude of the individual can also be seen. We are very curious to see how the whole thing develops in the future, also in relation to the Covid-19 pandemic and the various wars. The shortage of raw materials, price increases, etc. have once again stimulated reflection.

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