

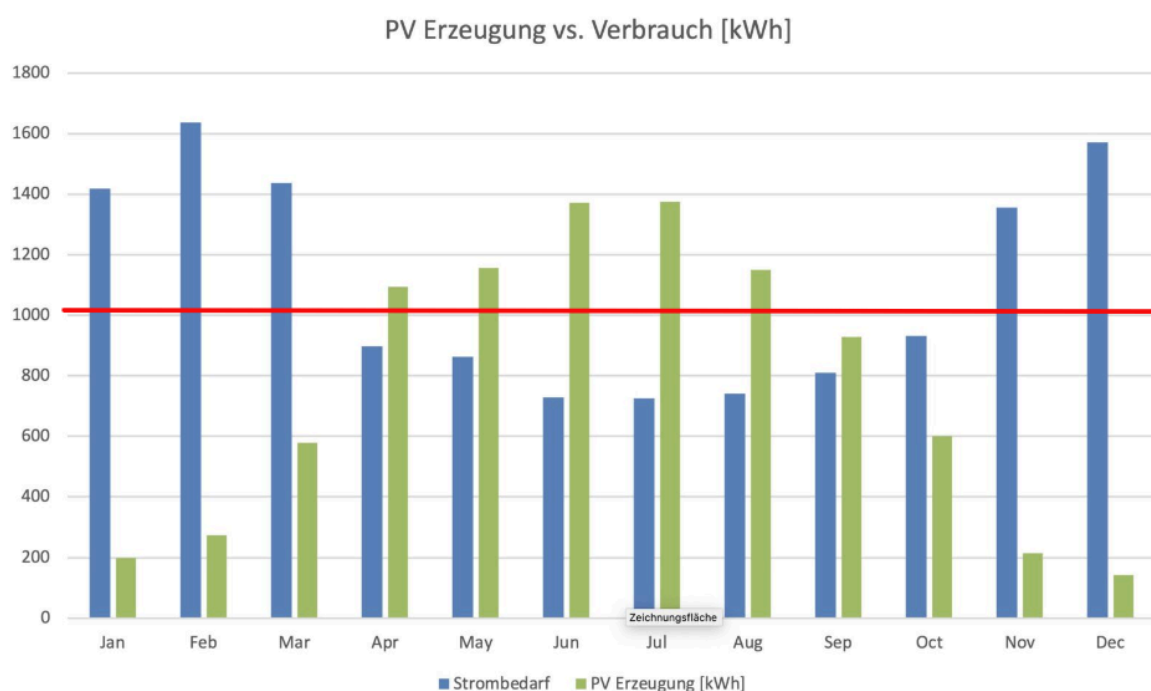
Photovoltaics - Maximized Output vs. Reasonable Self-consumption Ratio

Before we dive into the subject I'd like to give some insights:

Annual energy need (Swiss single family household)	Self-consumption (Swiss single family household)
4'000 kWh per year for electricity 6'000 kWh per year for heating 2'000 kWh per year for an electric car, sauna or others 12'000 kWh in total	A high self-consumption is very important because this is the energy one uses directly from the roof by e.g. using the washing machine, the heat pump or charging batteries (storage or e-car) during daytime.

Bearing in mind these two facts above I want to highlight the main misunderstanding when customers ask me to plan a photovoltaic installation since we always have a tradeoff of getting a maximized roof-output (= a lot of energy) vs. a high self-consumption ratio (which should be around 80%). Customers usually get this wrong because they believe the more panels they have installed, the higher the self-consumption will be, which is wrong.

Let us check the following graph:



Source:

<https://technikblog.ch/2019/01/ausfuehrliche-analyse-von-stromerzeugung-und-verbrauch-in-einem-efh>

The red line would be the ideal situation (gradual consumption that smoothens the peak). In reality we face a massive shift between consumption peak during wintertime (due to heating) and the production peak during summertime (due to the sunny days) and that is a real dilemma for a reasonable self-consumption ratio.

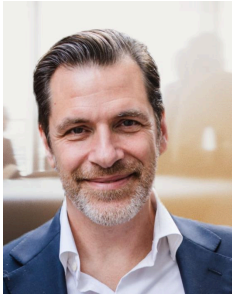
You may ask why I believe that the self-consumption ratio must be at least around 80 %? Here the reasons:

1. Overproduction causes massive oversupply the grid must balance out (= network stability risk)
2. Massive investments are required in order to strengthen the grid (= costs we all have to pay)
3. Owners don't get much money for this energy (= an economic disaster)
4. Installations produce mainly for the grid, owners get disappointed (= frustration)

What can we do in order to balance out this situation? I say there are many ways to optimize an installation in order to get a high self-consumption ratio of 80% and more. But how to achieve this?

1. Each of us can reduce their energy needs. 20 to 30% less is possible (e.g. heating temperature down to 20 degree, reduction of warm water usage, less electricity usage by stopping stand-by mode or LED lamps, etc.)
2. A photovoltaic installation should not be planned to cover the peaks it should cover 80%. This means less panels on the roof.
3. Usage of batteries in order to store some of the energy peaks for usage during the evening or night.
4. Using an electric car ideally with bi-directional charging (that means the car is charged during the day and in the evening the car acts as a battery for the household).
5. Acceptance that in wintertime any photovoltaic installation cannot really cover the heating consumption...

All these measurements will help to have a high self-consumption ratio without spoiling the grid. Our grid was designed as a top down grid; but today with all these de-centralized installations the capacity problems will not be solved overnight (even if we would wish this).

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