Guideline for Prosumerism calculation tool

EFFECT4buildings Toolbox:

Prosumerism; Annex 4a

EFFECT4buildings

The project “Effective Financing Tools for implementing Energy Efficiency in Buildings” (EFFECT4buildings) develops in collaboration with public building managers a comprehensive decision-making support toolbox with a set of financial instruments: **Financial calculation tools**; **Bundling**; **Funding**; **Convincing decision makers**; **Energy Performance Contract**; **Multi Service Contract**; **Green Lease Contract**; **Prosumerism**. The tools and instruments chosen by the project has the biggest potential to help building managers to overcome financial barriers, based on nearly 40 interviews with the target group. The project improves these tools through different real cases.

To make sure building managers invest in the best available solutions, more knowledge on different possibilities is needed as well as confirmation from colleagues that the solutions performs well. EFFECT4buildings mapped **technological solutions** for energy efficiency in buildings with the aim to share knowledge and experiences of energy efficiency solutions among building managers in the Baltic Sea Region.

This document includes guidelines for how to use the EFFECT4buildings prosumer tool. It starts whit what can be achieved with it and continues with instructions on how to achieve it. In the end it gives an example form Gulbene, Latvia where the tool was used.

Partners

EFFECT4buildings project is implemented with the support from the EU funding Programme Interreg Baltic Sea Region (European Regional Development Fund) and Norwegian national funding. The aim of the project is to improve the capacity of public building managers in the Baltic Sea Region by providing them a comprehensive decision-making support toolbox with a set of financial instruments to unlock the investments and lower the risks of implementing energy efficiency measures in buildings owned by public stakeholders. More information: http://www.effect4buildings.se/

Contents

1. Guidelines for EFFECT4buildings prosumer tool

1.1. What can you achieve by using this tool?

1. To determine the optimal size of the PV system
2. To find out how much electricity can be produced from a selected area
3. To make financial calculations to identify savings, income, necessary investments, repayment time and the overall profitability of the system
4. To find out how a storage system would improve PV systems efficiency

Information needed for energy production calculations:	Once you have identified and entered the parameters above, you can find monthly and annual results in the results section for:
• Solar system capacity • PV systems production profile • Annual current electricity consumption • Storage system parameters	• Solar electricity production • Electrical demand/need • Direct own consumption without storage • Own production quota without storage • Degree of self-sufficiency without storage • Used electricity for charging the system • Own consumption with storage • Own production quota with storage • Degree of self-sufficiency with storage • Storage losses • Share of production in storage losses • Over production • Remaining power outlet

Information needed for financial calculations:	After entering the data, the EFFECT4building tool allows you to obtain information about:
• Price per kWh for purchased energy • Energy tax • The net owners fee • VAT • Area of PV plant	• Savings for one year • Income for one year • Total investment cost • Internal rate of return • Pay-back-time, year

1.2. How to determine the optimal size of the PV system?

By knowing the amount of energy needed to produce, it is possible to change the input data – the area of PV system and the system's capacity, until needed amount of energy produced shows in the results, in that way the optimal PV system's area can be determined.

1.3. How to determine the impact of a storage system?

By choosing "yes" to the question "Should battery storage system be included?" and by specifying systems total capacity and DOD it is possible to see how energy production form planned PV system and its usage can change if storage system is added.

Storage system	value
Should battery storage system be included?	yes
total capacity	210,0
DOD (*depth of discharge*)	100%
maximum power when charging	50,0
maximum power output	50,0
charging efficiency	93,8%
discharge efficiency	93,8%

results	value
solar electricity production	96 513,37
electrical demand/need	500 000,00
direct own consumption without storage	91 106,02
own production quota without storage	94,40%
degree of self-sufficiency without storage	18,22%
used electricity for charging the system	5 344,94
own consumption with storage	96 450,96
own production quota with storage	99,94%
degree of self-sufficiency with storage	19,16%
storage losses	642,23
share of production in storage losses	0,67%
over production	0,00
remaining power outlet	404 191,27

1. Figure

On the left - Tools storage system data input, On the right – Results with storage

2. Example for Latvia

Gulbene's municipality plans to install a solar power plant on the local government administration building. Planned solar panel layout is shown in Figure 3.3.1.1. The solar power plant must produce at least 49,60 MWh of electricity per year for the first 5 years of operation. The total power of the system must be at least 54,60 kWpeak but not more than 75 kW. The building consumes about 142 MWh of electricity during the year.

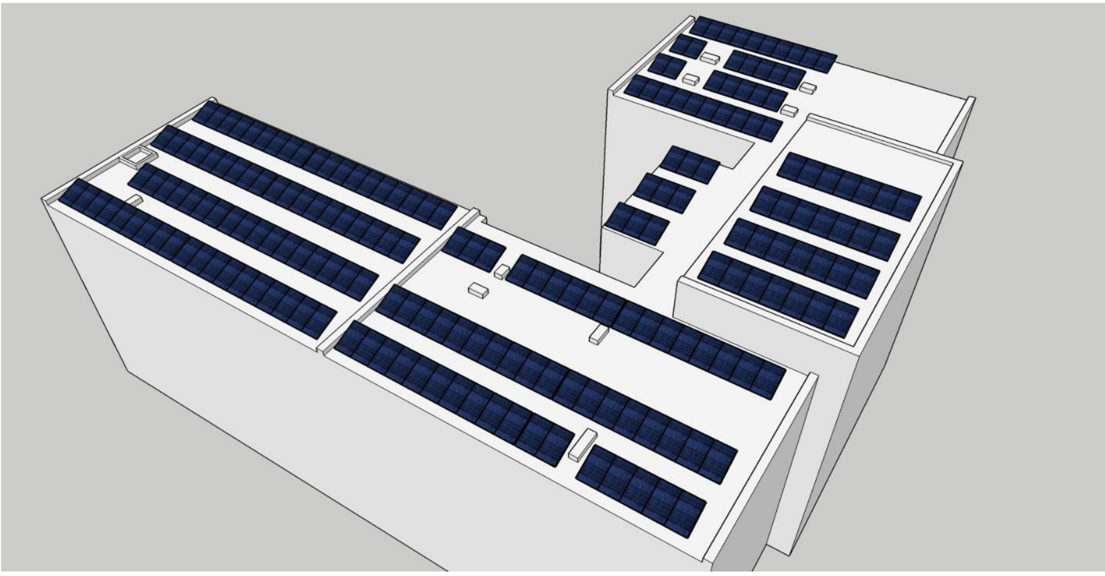


Figure 2. Planned solar panel layout

Because Gulbene already knew area for PV system and planed PV system's capacity, the tool was used for calculation of solar electricity production and for financial calculations.

2.1. Data input

Entered required information for Gulbene project:

PV system	**value**	**unit**
installed effect	54,60	kW_p
production profile:	PV Sun south 30°	-

1. On PV system about solar system's capacity and select optimal production profile. Production profile describes the temporal course of produced power. You can add your own or select from the given. Gulbene selected "PV Sun south 30°" production profile.

Electricity use	value	unit
energy load profile	Office	-
yearly electricity need	142 000,00	kWh

Storage system	value	unit
Should battery storage system be included?	no	-
total capacity	94,5	kWh
DOD (*depth of discharge*)	N/Y	%

2. On electricity use about yearly electricity need that can be gotten from energy consumption reports, and select optimal energy load profile. You can add your own or select from the given. Gulbene selected “Office” energy load profile.
3. On storage system about if PV system includes battery storage, and if it does, its total capacity and DOD. Gulbene system doesn’t include battery storage.

2.2. Results & Charts

Results on yearly basis

results	value	unit
solar electricity production	47 370,82	kWh
electrical demand/need	142 000,00	kWh
direct own consumption without storage	38 517,20	kWh
own production quota without storage	81,31%	%
degree of self-sufficiency without storage	27,12%	%
used electricity for charging the system	N/A	kWh
own consumption with storage	N/A	kWh
own production quota with storage	N/A	%
degree of self-sufficiency with storage	N/A	%
storage losses	N/A	kWh
share of production in storage losses	N/A	%
over production	8 853,62	kWh
remaining power outlet	103 482,80	kWh

Based on inserted data, Gulbenes planed PV system in a year will produce 47 370,82 kWh, with direct own-consumption of 81,31% and self-production quota of 27,12%.

The share of own-consumption is the dependency between the total direct consumption and the total amount of energy produced, while the degree of self-sufficiency is the dependency between the amount of self-consumed electricity and the total amount of electricity needed. By installing storage systems that allow produced energy to be consumed later, the share of own-production can be increased.

The resulting data suggests that planned PV system can produce only 27% of the total amount of electricity needed. And by 2 229,18 kWh less than the required in technical specifications document (49 600 kWh/year). In order to produce at least 49 600 kWh/year, the capacity of the installation must be increased to at least 57,17 kWp.

2.3. Financial calculation

1			
2		**Step 3 Simple financial calculation for investment in PV plant**	
3			
4			
5		Data from solar energy maps calculations	
6		Data that should be entered for each case	
7		Data that becomes more accurate if it comes from real calculations	
8			**Annually**
9	**Savings**	Estimated production from solar energy maps, kWh	47 371
10		Electricity not needed to buy, kWh	38517
11		Price per kWh for purchased energy, EUR/kWh	6,00
12		Energy tax (is only payed for purchased energy), EUR/kWh	2,20
13		The netowners fee for transporting the electricity to you, EUR/kWh	4,53
14		VAT, EUR	2,7
15		Sum of saved fees and taxes, EUR/kWh	15,40
16		Payment for saved electricity from electricity certificate, EUR/kWh	0
17		**Savings for one year, EUR**	**5933**
18			
19	**Income**	Sold ownd produced electricity, kWh	8854
20		Tax deduction for sold electricity, EUR/kWh	
21		Grid value (payment from grid owner for no transport of electricity) EUR/kWh	
22		Payment for produced electricity from electricity certificate, EUR/kWh	
23		Payment for sold electricity, EUR/kWh	6,00

Input data for financial calculations for each country is different. Energy price, tax and other values depend on each countries policies. For Gulbene, as a result of 38 517 kWh of direct electricity consumption, which was not required to be procured, it is possible to save EUR 5 933 per year through planned PV system. The share of own-production results in overproduction of 8 853,62 kWh, which can be sold for EUR 531 a year. When taking in consideration rough system installation costs of EUR 40 109, the internal rate of return is 0,2 and the pay-back-time is 6,2 years.

Annex No. 1

Results on yearly basis

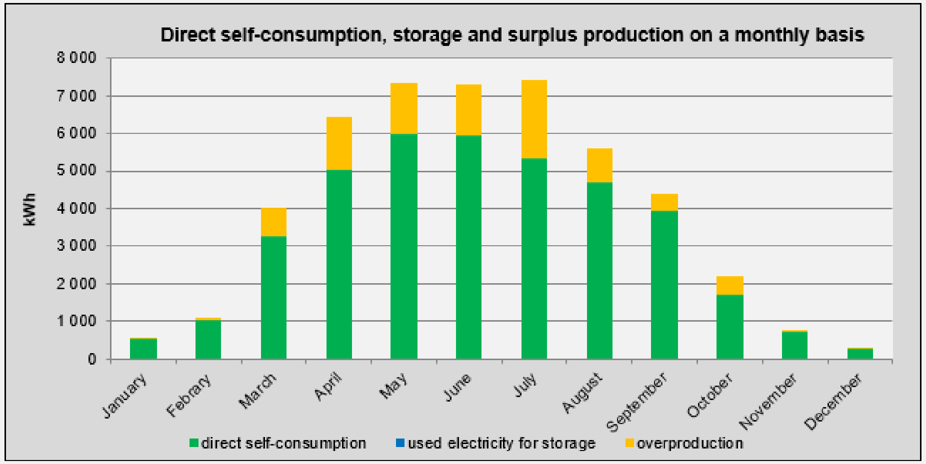
results	value	unit
solar electricity production	47 370,82	kWh
electrical demand/need	142 000,00	kWh
direct own consumption without storage	38 517,20	kWh
own production quota without storage	81,31%	%
degree of self-sufficiency without storage	27,12%	%
used electricity for charging the system	N/A	kWh
own consumption with storage	N/A	kWh
own production quota with storage	N/A	%
degree of self-sufficiency with storage	N/A	%
storage losses	N/A	kWh
share of production in storage losses	N/A	%
over production	8 853,62	kWh
remaining power outlet	103 482,80	kWh

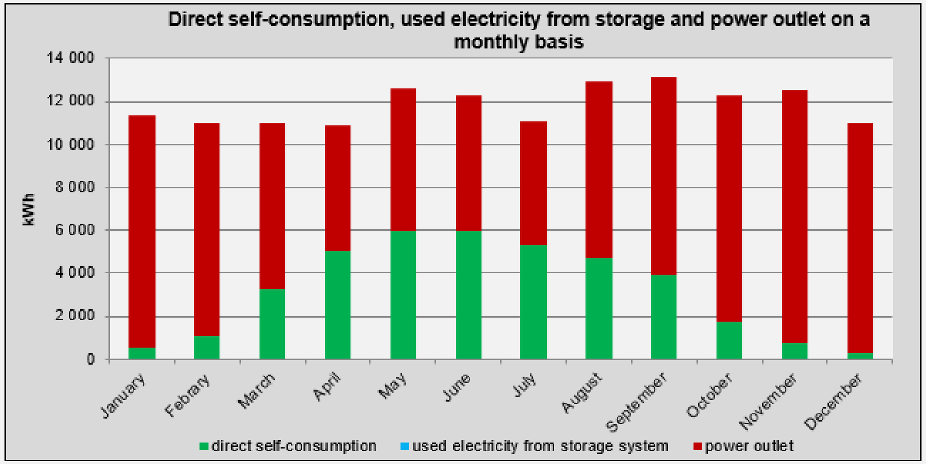
Results, monthly

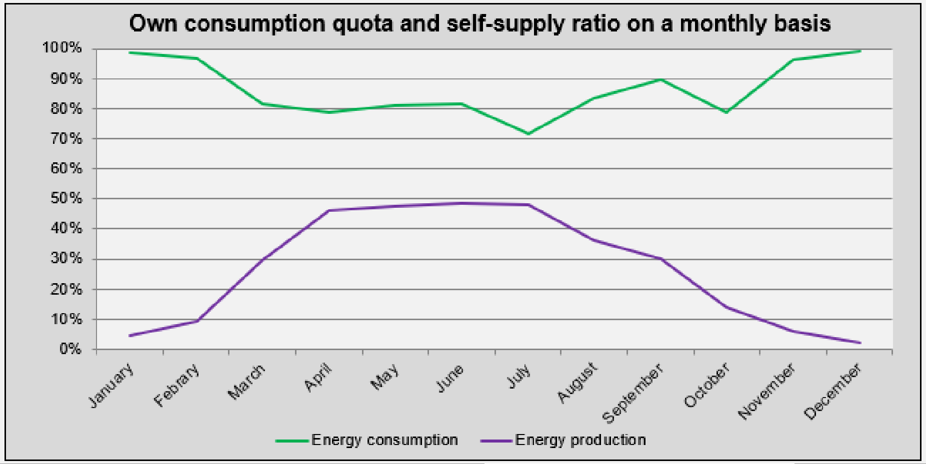
results	unit	January	Febrary	March	April	May	June	July	August	September	October	November	December
solar electricity production	kWh	531,10	1 078,95	4 007,82	6 431,20	7 352,55	7 300,66	7 433,05	5 626,69	4 408,47	2 191,17	752,70	256,46
electrical demand/need	kWh	11 338,28	10 982,82	11 005,51	10 898,37	12 583,67	12 251,93	11 088,20	12 906,51	13 121,15	12 242,02	12 565,95	11 015,59
direct own consumption without storage	kWh	524,41	1 041,38	3 268,76	5 053,21	5 980,34	5 949,46	5 339,91	4 702,68	3 954,16	1 723,32	725,02	254,57
own production quota without storage	%	98,74%	96,52%	81,56%	78,57%	81,34%	81,49%	71,84%	83,58%	89,69%	78,65%	96,32%	99,26%
degree of self-sufficiency without storage	%	4,63%	9,48%	29,70%	46,37%	47,52%	48,56%	48,16%	36,44%	30,14%	14,08%	5,77%	2,31%
used electricity for charging the system	kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
own consumption with storage	kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
own production quota with storage	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
degree of self-sufficiency with storage	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
storage losses	kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
share of production in storage losses	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
used electricity from storage system	kWh	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

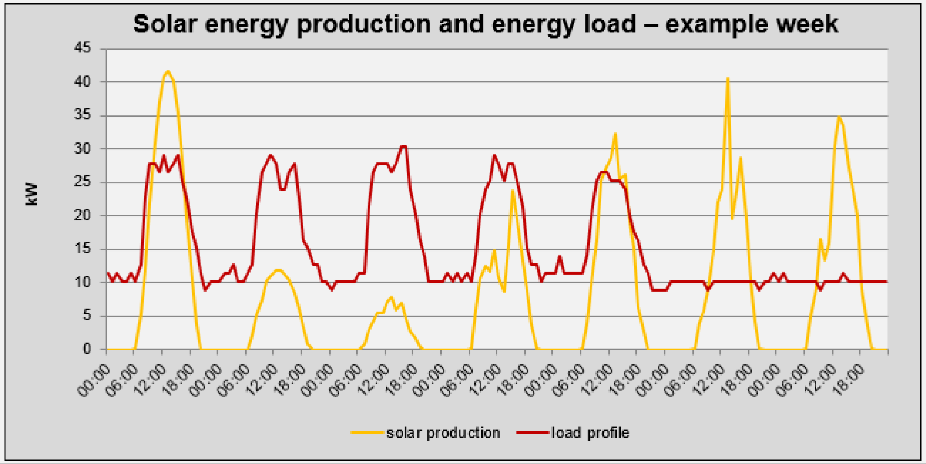
Annex No. 2

Charts









Interreg
Baltic Sea Region

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

EU STRATEGY FOR THE BALTIC SEA REGION
FLAGSHIP

EFFECT4buildings