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ENERGY TRANSITION
RenoWave

PROSUMERISM GUIDELINES FOR HOMABs

Guide on soler energy production for multi apartment buildings

County Board of Dalarna, Sweden

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CLIMATE-NEUTRAL SOCIETIES

About RenoWave

The project “One-Stop-Shop extended model to increase the multi-apartment building stock renovation in the BSR” (RenoWave) establishes cooperation among homeowners, construction companies, energy agencies, and public authorities to initiate more energy-efficiency renovations in multi-apartment buildings. The main result of the RenoWave project will be a One-Stop-Shop (OSS) model that includes traditional and additional OSS services that cover all the steps necessary to initiate and implement energy-efficiency renovation projects in multi-apartment buildings. The RenoWave project is implemented under the Interreg Baltic Sea Region Program 2021-2027 with the support of the European Regional Development Fund. Implementation time of the RenoWave project is January 2023 to December 2025.

Project partners

1. County Board of Dalarna (Sweden)
2. City of Lappeenranta (Finland)
3. Vidzeme Planning Region (Latvia)
4. Association of Communes and Cities of Małopolska Region (Poland)
5. Magistrat of the City Bremerhaven (Germany)
6. Baltic Environmental Forum Latvia (Latvia)
7. Housing Initiative for Eastern Europe (Germany)
8. Let’s renovate the city NGO (Lithuania)
9. Polish Foundation for Energy Efficiency (Poland)
10. North Sweden Energy Agency (Sweden)
11. Development Centre of Võru County (Estonia)

www.interreg-baltic.eu/project/RenoWave

The project RenoWave establishes cooperation among homeowners, construction companies, energy agencies, and public authorities to initiate more energy-efficiency renovations in multi-apartment buildings.

Summary

The guide contains advice and tips on how multi apartment buildings can invest in own solar energy electricity production and by then becoming a prosumerist (both producing and consuming solar energy).

There are several things to pay attention to when investing in a PV-plant, both technical aspects and how to achieve the best economic profitability.

Guidelines for solar energy in multi apartment buildings

Background

Many multi apartment buildings face high energy costs and the interest for investing in own solar energy production is increasing. The incentives for investing can be both to lower the energy costs, but also to become more independent and that will contribute to a more robust and sustainable energy system.

Own energy production from solar panels reduce the amount of electricity that needs to be bought. This can improve the primary energy use for the building, and by that reach a better energy class.

However, for multi apartment buildings there is a bit more challenging to set up a PV-plant then it is own single homes. There is a more complex decision making process, more technical aspects to consider and not least more economic factors to base the decisions on.

The RenoWave project has developed this general guide to support Home owned multi apartment buildings in taking decisions on solar energy investments. The situation varies a bit between countries in the Baltic Sea Area, so there might be special requirements that must be taken into account.

The development of the guide

This guide has been produced in transnational cooperation among partners in the RenoWave project, in lead of County Board of Dalarna in Sweden that has long experience in solar energy.

Guidelines for solar energy in multi apartment buildings

By installing solar cells on roofs or facades, a multifamily home can produce its own electricity and thereby reduce its electricity costs. The decision to install solar cells is a joint decision by the residents.

Where can solar panels be installed?

Solar cells are usually installed on existing roofs. Ground mounting systems or facade mounting may also be possible in some cases. Suitable directions are south, east and west. Solar cells in a south-facing position produce the most, but in the middle of the day electricity consumption may be lower. In an east-facing position, solar cells produce more in the morning and in a west-facing position more in the evening when the electricity use most often is higher. There are solar panels that can be installed with a very low roof pitch, but a higher pitch is an advantage. Before installing solar panels, the condition of the roof needs to be examined.

How to take decision on investing in solar energy?

The decision to install solar cells is a joint decision and is not something that an individual apartment owner can decide on. Decisions can normally be done by the homeowner association board or by a majority of votes from homeowners.

"Big things" that can influence the decision on investing in solar energy

Find out if there is a state support program for solar energy available and if there is, find out terms of conditions.

If a roof replacement is required anyhow, there are advantages to do the investment in solar panels at the same time.

How much electricity can you produce?

A 1 kW system placed due south with a 30–50-degree slope can produce about 1000 kWh per year. The solar cells then take up an area of about seven square meters.

What happens to the electricity that is produced?

The electricity that is produced is primarily used to meet the current needs of the building, most often for only the common areas. Any excess is automatically fed into the grid and the building owner is paid for it.

How big should a system be?

There is no lower limit for how big a PV system should be. From an economic point of view, however, there is an upper limit that is important to include in the planning. The most profitable is to size the system according to your own electricity needs in the summer so that you do not produce more than what is needed for your own use. Tax regulations mean that it is not very profitable for a housing association to sell surplus electricity.

The decisive factor in deciding on the size of a solar cell system is whether the association has a central electricity contract for all apartments or whether each apartment owner has their own subscription. The optimal size also depends on if the building has a battery storage or not.

This guide provides in-depth tips and advice for housing associations that are interested in investing in solar energy.

8 tips how to invest in solar energy

1. Check if a building permit is required or not. If they are to be angled up on a flat roof it is more likely that a permit is needed. A building permit may also be required if it is a historic building. Also find out if there is a need for a permit from or notification to the City Fire Department.

2. Start from the available roof surfaces and the condition of the roofs. Each roof has its own load-bearing capacity and the limits needs to be determined by an expert. Obstacles on the roof, such as chimneys, lathers and snow moving zones needs to be taken in account when deciding suitable areas for panels.
Panels can be mounted on most roofing materials. For sheet metal roofs, installation is usually problem-free. For concrete/brick roofs, an assessment of the remaining lifetime may be needed. If it is short, this can speed up the decision to replace the roof. An alternative is roof-integrated panels, which means new roof sheets where solar cells are already mounted on steel sheets.

3. Contact several solar energy companies to get quotes and solution suggestions. Getting quotes from more than one company makes comparison possible. Ask questions and feel free to request alternative solutions!
If the building has a contract with a building manager, the HOMAB might assign the manager to perform the tendering process and the rest of the process. In some cases, like in Lithuania, installation of PV panels, with all the terms and conditions, are included in the Investment Plan provided by Amiestas.

4. Check that the solar company is certified and has the right skills. All electrical work must be carried out by a qualified electrician. This also applies to connecting the panels. Correct installation of the PV modules is crucial for warranties to apply. Ask for references for similar work.

5. Check the proposed placement of panels. How does it look aesthetically? It is also important that they do not obstruct any firewalls or the function of snow guards and gutters etc. How has relations to the sun and shadows been taken into account? A calculation of snow loads needs to been done.

6. Request a detailed quote and compare what is included in the price. The price can vary significantly depending on the equipment and quality included.

A Compare which panels are offered. The most common on the market are monocrystalline silicon panels (glass/laminate or glass/glass). Glass/glass panels can be obtained without a frame, often with longer power and product warranties. Almost all panels are made in China but can have different efficiencies.
The most common color is black. For historical buildings other colors like brick red can be of interest but comes with a higher prize.

B Compare which inverter is offered. When selecting an inverter, it is important to understand whether you are installing a symmetrical or asymmetrical inverter. Symmetrical means that three phases are fed with the same amount of energy, and it can result in selling excess on one phase and buying electricity on other two phases.
A so-called string inverter is the cheapest. To be able to connect to a battery storage, a hybrid inverter is required. For multi apartment buildings it can be of interest with inverter systems that facilitate sharing of electricity between buildings.

C Is battery storage included in the quote? Solar cell installation in combination with batteries as electrical energy storage has become increasingly interesting, so it may be a good idea to prepare for future batteries or choose to invest in them at the same time.

D Find out which solution is included to monitor the electricity production from the solar cell system. A communication solution is needed between the inverter and computer/mobile to get information.

E Compare prices. Divide the purchase price (euro) for the PV system by the total module output (kWp). This gives the comparison figure euro/kWp. This is the most important key factor to compare the prize in different offers.

7. Make sure to get written terms for when the system should be installed and ready for use, and what happens if the supplier cannot meet this. Also compare payment terms and make sure the total price is clearly stated. A leasing solution can be very costly in the end compared to an outright purchase.

8. Always notify the electricity grid owner before starting the installation. If permission is not granted, it is usually because the electrical grid to the building is not sufficiently dimensioned. It must then be possible to cancel an order to the supplier. When the installation is complete, the solar installer notifies the grid owner. After approval, the installation can be started up.

A video in English discussing solar panel installations on a multi apartment building in City of Lappeenranta, Finland.
RenoWave project June 2024
https://youtu.be/xrQ2Rg05jsA?si=IXthuw5DYh3Fjx9A

Additional advice

Share solar system installation between buildings

It is possible to have a common solar energy system for several buildings and distribute the electricity between different houses, so-called energy communities. But there are some legal aspects that can be complicated, so the advice is to contact the responsible authority for clarifications.

Current tax regulations have a major impact on how interesting it is to create an energy community. No energy tax, VAT, grid fee or cost for power are paid for the self-produced electricity. However, in an energy community where the shared electricity passes through the electricity meter, energy tax, VAT and grid fee are added to the shared electricity. This is avoided if the meter is “moved out” and electrical connection points are combined in order to be able to share electricity behind the meter. Another alternative for the energy community is to build a parallel grid behind the meter that enables sharing of electricity without it passing through the meter.

Tax reduction on sold electricity

State programs for supporting solar energy installations vary a lot between countries. For example in Sweden there is a reduction on the income tax for each kWh exported. The electricity grid owner reports the amount of sold electricity every year, as a basis for the tax calculations

Compensation for grid utility

By feeding electricity into the grid, electricity losses and the costs of transporting electricity are reduced. In some countries, like in Sweden, grid owners are required to pay so-called grid utility for the electricity fed into the grid.

Feed-in fee

In some cases, the grid owner has the right to charge a feed-in fee for connecting a PV plant to the grid, even if it is mandatory to connect it. For example in Sweden, a fee can only be charged if the PV plant is larger than 63 A and the building owner sells more electricity than it buys. Then it is no longer considered being a micro-producing unit.

Income from sold electricity

Electricity surplus will be exported to the grid. The company that has the contract to sell electricity to the building can also by the surplus exported. The prize that will be paid vary between countries and companies. In some countries a normal prize is equal to approximately the market prize. In other countries there is a fixed price.

Battery

Energy storage in the form of batteries involves a high investment cost. The benefit of a battery is that self-produced electricity can be stored for use after sunset or to store purchased electricity at a low price. A battery can help to lower power peaks, meaning minutes/hours when a lot of electricity needs to be purchased. It can help to reduce extra costs from the grid owner.
Batteries can also be a solution for islanding, continuing to generate electricity even if the grid is down.

Frequency Services sold to aggregators

Trading with frequency services means that compensation is given to an actor who can temporarily reduce/increase their electricity consumption to lower power peaks. Markets for this type of service are under development by so called aggregators. For example, it may be possible to receive some compensation by “renting out” a battery and receiving compensation from an aggregator that will use it to regulate the frequency in the electricity grid (through remote control). Compensation can also be given for time control of electric car chargers.

Agreement on fixed or variable electricity price

It is not possible to give general advice on whether it is most advantageous to have a fixed or variable price in your electricity contract. A fixed price means financial stability, while statistics show that many have benefited in the long run from having a variable electricity price. If you choose a variable hourly price, you should be active and have the ability to be flexible, so that you adapt your electricity use to the price. Your financial capacity also needs to allow the fluctuation in energy costs.

Size of PV plant based on tax rules

It is most profitable to size the PV system so that as much self-produced solar electricity as possible will be for own use. This is because it is more profitable not having to buy electricity compared to be able to sell electricity and a real home owner association that sells more electricity than it buys on an annual basis need to report this as an income.

Joint or individual electrical meters

Whether the home owner association has joint or individual metering of electrical energy determines the size of the recommended PV system based on profitability.

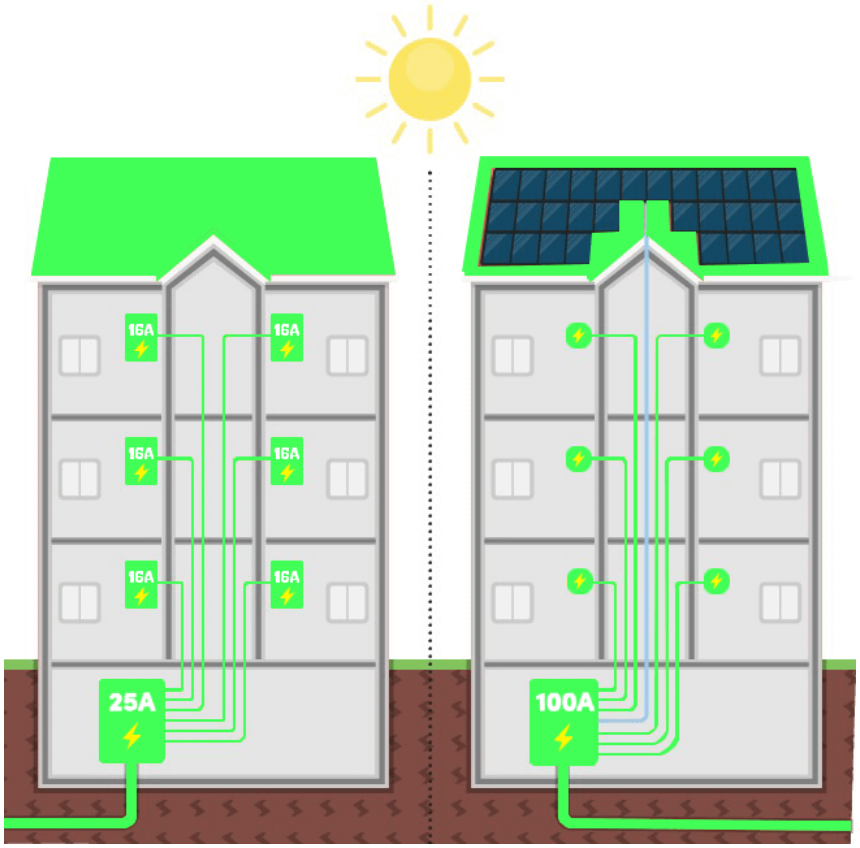
Joint meter and joint electrical contract

The model means that the home owner association has an electricity subscription with a main electrical meter that measures the buildings total electricity use and then has own sub-meters for each apartment owner. The association measures and invoices the apartment owners for their electricity use. (Invoicing could also be done based on calculations without submeters, but then the incentives for energy savings are removed and it is not really fairly between apartment owners.) This means that the association has significantly higher electricity use and that a PV system can therefore be larger to still match the buildings total electricity use.

Replacing individual electricity subscriptions with a joint subscription for a main meter means overall a lower subscribed power, which means a lower fixed cost for electricity.

Individual electrical meters

The model means that each apartment has its own electricity subscription and pays its own electricity bill to the grid owner and chosen own electricity trading company. A PV system should then be sized to only meet the buildings common electricity, i.e. common electricity use in stairwells, laundry rooms, etc.



An illustration showing the principal differences between systems with joint or individual electrical meters.

To the left all apartments have their own electrical meter and contract with a supplier of electricity, normally 10 or 16 Ampere. There is also one contract and meter for common areas in the building. In total 6 x 16 A + 1 x 25 A = 121 A.

To the right there is a joint meter and contract for all the electricity needed in the building, both for common areas and for households. For the joint contract it is enough with 100 A in total electricity subscription. Each apartment has a submeter. The Home Owner Association for the building distribute invoices to the apartment owners.

Calculation example for joint or individual electricity meters

A multi apartment building has 20 apartments with an average electricity consumption of 2 500 kWh/year. In addition, there is an electrical subscription of 25 A for common electricity use in the building that amounts to 17 000 kWh/year.

Alternative with individual electrical meters

Each apartment has its own 10 A subscription with the grid owner. The fixed annual fee is 126 euro/year and the electricity price is 9 cent/kWh, including VAT.

Fixed annual cost for all apartments is 2 520 Euro
(20 x 126 Euro/year).

Variable annual cost for all apartments is 4 500 Euro
(20 x 2 500 kWh/year x 9 cent/kWh)

Total costs for all apartments: **7 020 Euro.**

Fixed cost for the building common electricity is 678 Euro.

Variable cost for the common property electricity is 1 530 Euro
(17 000 kWh x 9 cent/kWh)

Total costs for the common property electricity: **2 208 Euro**.

Total electricity cost for the building: 9 228 Euro.

Alternative with joint electrical meter

The building has a joint electricity subscription of 63 A and its own meters to charge the apartment owners.

Fixed cost for the electricity subscription is **2 274 Euro/year**.

Variable cost for electricity is **6 030 Euro/year**
(67,000 kWh/year x 9 cent/kWh)

Total electricity cost for the building: 8 304 Euro

The cost of administering electricity billing is additional.

Profitability comparison

Investment in sub-meters for electricity in 20 apartments costs approximately 200 Euro/apartment, i.e. a total of approximately 4 000 Euro.

The price difference between individual electricity meters and joint electricity meter is 924 Euro/year (Euro 9 228 – 8 304)

The payback period for the investment in individual metering and billing is **4.3 years** (4 000 Euro/ 924 Euro/year).
The cost of administering electricity billing is added.

One-Stop-Shop extended model to increase the multi-apartment building stock renovation in the Baltic Sea Region

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