



# A Homeowner's Guide to Solar PV

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## **What is Solar Photovoltaics (Solar PV)?**

The term 'solar panel' is often used interchangeably to describe the panels that generate electricity and those that generate hot water.

- Solar panels that produce electricity are known as solar photovoltaic (PV) modules. These panels generate electricity when exposed to light. Solar PV is the rooftop solar you see in homes and businesses. Solar electric panels capture the light from the sun and convert it into the electricity that is used in your home to power your TV, kettle, toaster, phone charger, radio, oven, and so on.
- Solar panels that produce hot water are known as solar thermal collectors or solar hot water collectors.

SEAI provides grant support for both Solar PV and Solar Hot Water Collectors. This guide focuses on Solar PV for renewable self-consumers.

## **How can you benefit from investing in Solar PV?**

- Reduce your electricity bills by generating your renewable electricity.
- Increase the efficiency and add to the value of your home
- Reduce your reliance on electricity generated from fossil fuels
- Support the environment by reducing your greenhouse gas emissions.

Solar PV is a reliable and sustainable source of renewable energy that can help reduce your reliance on grid electricity and the related cost volatility. Once installed, solar PV will provide electricity quietly, cleanly, and affordably for 25 or more years with minimal maintenance requirements.

## **Installation of domestic solar PV system**

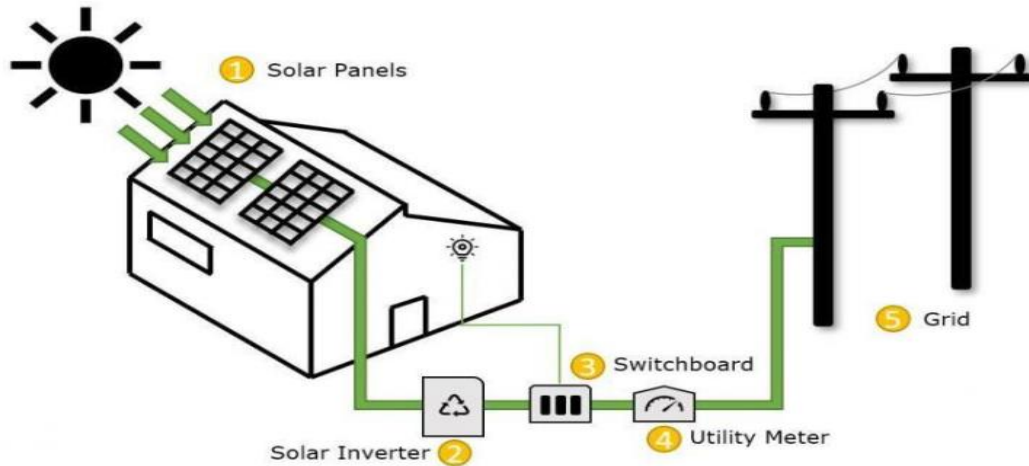
A domestic solar PV system consists of several solar panels mounted generally to your roof and connected to the electrical loads within your building. The solar panels generate DC (direct current – like a battery) electricity, which is then converted in an inverter to AC (alternating current – like the electricity in your domestic socket). Solar PV systems are rated in kilowatt peak (kWp). A 1kWp solar PV system would require 3 solar panels on your roof.

Any excess electricity produced can be stored in a battery, or other storage solution like your hot water immersion tank or Electric Vehicle. It can also be exported from your house into the electrical network on your street.

## **Generating electricity from solar PV**

Solar PV systems generate electricity during daylight hours only, predominately around the middle of the day. In Ireland, around 75% is produced from May to September. If this electricity is not used in the home, it is exported to the grid.

It is desirable to maximize the amount of solar electricity you use in your home. You can do this by sizing the solar PV system to meet your demand.



**Figure 1: Solar PV arrangement including inverter and battery.**

## Considerations

### When to invest

Before considering an investment in solar technologies, it is also important to assess the energy performance of the whole home. We recommend the following approach to improve the comfort of your home and reduce your carbon footprint:

1. Ensure your home has a good energy performance rating (BER). This means insulating walls and attic and ensuring that you have good double or triple-glazed windows.
2. Upgrade your heating system by installing a heat pump.
3. Consider Solar PV or Solar Thermal.

### Roof orientation

- The most suitable roof is south-facing and generates the most electricity. However, any roof in good condition with no shading could work well. Shadows on solar panels can greatly reduce their ability to generate electricity, especially those caused by objects less than 10 meters from the panels.
- Solar panels are expected to last over 20 years. Your installer should check that your roof is in good condition for a PV system.
- Installing solar panels on your roof will typically mean that additional timber roof support needs to be added to your roof. The solar panel racking system is attached to these new timber supports.

### Sizing the Array

The size of the Solar PV system you purchase will depend on several factors,

- amount of electricity you use in your home.
- Time of day you are at home
- Orientation of your roof
- Available area: the available roof area may restrict the system size, particularly in smaller homes.
- Self-consumption: for a given installation the more of the energy that can be used on site the better.

- Budget: often the available budget is the dominant constraint.

Your selected installer should discuss all of the above factors with you. Your installer will also check your current and past electricity consumption to calculate the appropriate system size.

## Equipment

SEAI offers guidance to solar PV companies on the type of systems that are eligible for grant funding under the solar PV scheme. This includes guidance on performance eligibility, installation, certification, and design.

- A typical solar array consists of several solar PV modules. These modules are typically 1.8m x 1.0m, approximately 40mm thick, and weigh in the region of 20kg each.
- The modules are fixed to the roof by a mounting system, a metal system of rails, clamps, and hooks that keeps the array securely fixed to the roof. Modules can be arranged in both landscape (horizontal) or portrait (vertical) orientations. This depends on the orientation of the roof, the required number of panels, and existing roof obstructions (chimneys, skylights, etc).
- The cabling generally runs from the PV array and into the home to the inverter. The inverter is the mechanism that converts the PV-generated DC to AC. This inverter will be sized to suit the size of your solar array. If you are installing a battery, or plan to at a future date, you will need a hybrid inverter.
- Optional extras include batteries and hot water diverter.
- The battery is an energy storage solution that allows you to store the excess energy generated from your solar for later use in your home. Batteries can also allow you to charge from the grid at night, further reducing your energy costs. There are several variables when deciding on whether to install a battery and these should be researched and discussed thoroughly with your Solar PV company.
- A hot water diverter allows you to divert excess energy generated from your solar PV to heat hot water in your tank. It is a cost-effective way to maximize the energy produced by your solar PV system.
- Most Solar PV systems now come with an energy monitoring system or are compatible with monitors that can be added later. These are an effective way to monitor the energy produced, energy consumed, and energy exported.
- You do not need a smart meter to avail of the SEAI grant.



**Figure 2: PV Module**



**Figure 3: Inverter**



**Figure 4: Diverter**



**Figure 5: Battery**

## Operation and Maintenance

Solar panels generally require very little maintenance to function, given the fact that they are effectively self-cleaning. They may occasionally need a light cleaning to make sure dirt, leaves, and other debris are not obstructing sunlight.

- Maintenance of your electrical system should follow the advice of ESB Networks <https://www.esbnetworks.ie/staying-safe/safety-at-home-group/safety-at-home>
- After installation, your solar PV company will provide you with an operation and maintenance manual as well as data sheets and warranty information for the components.
- Make sure your company/installer shows you how the system works and how to operate the system to achieve consistent optimum system performance.
- Ask your solar PV company about their after-sales service and replacement parts should they be needed.

## Installation Costs and Payment

- To understand the financial benefits, you should consider the payback period cost of installation and the reduction in electricity required from the utility provider.
- It is Advisable to ask your Solar PV company to provide you with a detailed quotation showing total cost, expected annual generation, financial benefits, Bill of materials, Warranty info & payment terms.
- Ask your Solar PV company for the details of what is and is not included in their quote, including parts and labour costs, VAT, and extras like battery, hot water diverter, or monitoring system.
- Make sure you are clear on whether the grant is included or not and what the expected value of the grant is based on the size of your system.
- Ensure you are clear on any additional cost to the above-quoted figures to complete the installation and whether there are financing options and payment terms.
- Grant payments from SEAI will only be processed when all documentation has been received from your solar PV company. Please make sure your installer provides you with *all* essential documents and uploads them to your online application.

## Requirements for SEAI Grants

- The Applicant must first apply for and receive grant approval, they will then have 8 months to complete the works and submit the Declaration of Works and required documentation.
- All systems installed must comply with the requirements set out in the Code of Practice as published on the SEAI website and the Declaration of Works must be completed and signed off by a Solar PV Scheme Registered Installer. In addition, registered Installers must provide homeowners with the following to achieve compliance under Scheme Rules:
  - ❖ *Datasheets for components*
  - ❖ *Warranties for components*
  - ❖ *Operation & Maintenance (O&M) Manual*
  - ❖ *Basic start-up, shutdown, safety, operation, and maintenance instructions*
  - ❖ *Estimation of system performance*
- The maximum grant levels are outlined on the SEAI website <https://www.seai.ie/grants/home-energy-grants/solar-electricity-grant/>
- Homeowners are required to complete a Building Energy Rating (BER) on their home after the supported works have been completed and signed off.
- Grants may only be claimed after the measures are fully completed and the company has been paid by or has entered into a financing agreement with the homeowner.

- The contract of works agreed is between the Homeowner and the Contractor only. SEAI accepts no liability or responsibility for any breach of contract between the Homeowner and the Contractor. SEAI does not approve the contractors/installers.

For the full list of Terms & Conditions please refer to the Solar PV Scheme Application Guide, available at:

<https://www.seai.ie/grants/home-energy-grants/individual-grants/solar-electricity-grant/Solar-PV-Scheme-Guide-1.pdf>

## **How to sell electricity back to the grid**

Homes with PV systems that generate more energy than they consume can now export that excess to the grid and benefit from payment for that exported electricity. This payment is known as the Clean Export Guarantee (CEG) and is essentially a feed-in tariff. This tariff will be paid at a 'competitive market rate' from your electricity supplier. Each supplier will set their rates so you will need to contact your electricity supplier directly for details of their CEG rates.

The CEG will be available to both new and existing micro-generators, subject to the eligibility criteria.

You will need to have a suitable ESB Networks export grid connection to avail of the CEG.

You will also need to have a smart meter installed to get paid precisely for what is exported. If you do not have a smart meter installed, you will get paid based on a *deemed volume* assumption determined by the CRU.

**You do not need a smart meter to avail of the SEAI grant but may need one to avail of the clean export guarantee, which is a payment for excess power to the grid.**

You will continue to be able to apply to the Sustainable Energy Authority of Ireland (SEAI) for a grant towards the cost of installing equipment.

- for information on the Clean Export Guarantee (CEG) contact your electricity supplier in the first instance
- for information on grid connections, contact ESB Networks
- for information on grants, contact the Sustainable Energy Authority of Ireland

## **Choosing Your Solar PV Company**

Under the SEAI grant scheme a solar PV system must be compliant with all applicable Irish legislation, building regulations, and applicable guidance. The **Company** has total responsibility for ensuring compliance. The Installer must be registered on SEAI's Solar PV Installer Register at the time the installation is carried out. The Installer must satisfy themselves, and certify, that the solar PV system installation has been designed, installed, tested, and commissioned in accordance with the code of practice, and other relevant codes, standards and building regulations. The Installer must, at his/her cost, provide all information required by SEAI or SEAI's agents for the purposes of audit and inspection.

- SEAI recommends you get at least four quotes from different companies, research the company online, ask to see references to past projects, and/or speak to past customers of the company.
- SEAI strongly advises that you do not proceed with works unless a written contract is in place between you and your contractor. This affords you appropriate levels of consumer protection.

- Please ensure that the company you plan to engage is on the SEAI Registered Companies list and be on the alert for people offering solar PV who are not registered with SEAI. These installations do not qualify for SEAI grant support.

## **Health & Safety Competency**

Under Health & Safety (H&S) regulations a PV company must prove their competence to you to carry out the work safely in your home. Under these regulations you also have responsibility to appoint competent personnel. The following checklist of questions will help you determine if a PV company is competent to carry out the construction work you need done in your home. If they are, this will mean that in general they comply with legal requirements.

### **Checklist:**

#### Suggested General questions

- Are you competent to carry out this work?
- Have you completed work like this before?
- Have you and your staff received safety training or done any safety courses?
- Does your company have a Safety Statement and can you provide me with it?
- Can I have references for previous work or visit previous work that you have done?
- Have the Health and Safety Authority (HSA) ever taken enforcement action against you or your company?

#### Other questions you could ask (not related to health and safety but helpful)

- Have you a tax clearance certificate?
- Have you got insurance?
- Are you a SEAI registered installer?
- Can you provide me with a detailed quotation and contract of works?

## **Questions to ask your selected Company:**

- How much energy will the PV system produce in a year?
- What is the total cost?
- What are the ongoing service and maintenance costs?
- What warranty is provided
- Is my roof and electricity demand suitable for PV?
- Is planning permission required?

Your Company should provide a specific design and payback for your house.

Visit the SEAI website for a list of active solar PV companies.

## **Frequently Asked Questions on Solar Photovoltaics**

If you have any comments on these FAQs, please contact [info@seai.ie](mailto:info@seai.ie)

1. *What are solar panels?*
2. *What different types of solar PV panels exist?*
3. *How much electricity will solar panels generate?*
4. *Do solar panels work in Ireland?*
5. *How much do solar panels cost?*
6. *Where are solar panels manufactured?*
7. *Are solar panels right for my home?*
8. *Who can install solar panels on my property?*
9. *Do I need planning permission to install solar PV on my roof?*
10. *What will be installed in my home if I purchase a rooftop solar PV system?*
11. *How will the solar panels be fixed to my roof?*
12. *How can I maximize the amount of electricity generated that I use?*
13. *What about a battery storage system?*
14. *What supports are there for solar PV in homes?*
15. *Is there a 'feed-in tariff' payment for excess solar electricity fed into the grid by owners of solar PV systems?*
16. *Does my rooftop PV system require maintenance?*
17. *What is the difference between domestic and non-domestic solar PV schemes?*

### **1. What are solar panels?**

The term 'solar panel' can refer to a wide range of solar technologies. It is often used interchangeably between the panels that generate electricity and those that generate heat. Solar panels which produce electricity are referred to in the industry as 'solar photovoltaic (PV) modules.' These are panels made from materials that generate DC electricity when exposed to light.

When considering purchasing solar panels it is important to consider whether you would like a system that generates electricity (solar PV panels) or a system that heats water (solar thermal panels). The questions in this document are all about the electricity-generating panels.

### **2. What different types of solar PV panels exist?**

There are a variety of different solar PV technologies and products. The performance and cost of different products vary greatly. The most common solar PV technologies are:

- ❖ Mono-crystalline silicon panels: Typically, the most efficient commercial solar panels at converting light into electricity.
- ❖ Multi-crystalline silicon panels: typically, slightly less efficient than mono-crystalline panels but often less expensive
- ❖ Thin film panels: this encompasses a range of technologies (including those made from cadmium telluride (CdTe), copper indium gallium Di selenide (CIGS), and amorphous silicon (a-Si)). These technologies are not as widely deployed but are often favoured because of their appealing appearance.

Silicon-based solar panels are by far the most deployed, accounting for over 90% of the global market. When considering installing solar PV panels on your roof you will typically be limited to the products which



individual installers offer. Be sure to ask to see the technical specifications for the solar panels they are offering. You can find out more about understanding how to read technical specifications [here](#).

### **3. How much electricity will solar panels generate?**

The amount of electricity generated annually will depend on a range of factors including the hardware chosen, the size of the system, the geographical location, and the direction in which the panels are installed. With the most common silicon solar panels typically 1 sq. m of panels will generate ~150W of power on a clear sunny day (that's enough to power a laptop computer). A home solar PV system sized at 20 sq. m (~3kW) would generate around 2,600kWh of electricity a year if well-located, over 40% of the typical annual electricity demand of an Irish home.

### **4. Do solar panels work in Ireland?**

Yes, solar PV systems will still generate electricity when there is daylight, so they will still function on overcast days in Ireland. In these conditions they will not be able to produce power at their maximum rated capacity (the figure in kilowatts (kW)), rather at some fraction of this figure. Solar panels will perform at their best in direct sunlight and therefore solar PV systems in Ireland will typically produce less than other, sunnier countries such as Spain. As mentioned above, a home solar PV system sized at 20 sq. (~3kW) would generate around 2,600kWh of electricity a year if well-located, over 40% of the typical annual electricity demand of an Irish home.

### **5. How much do solar panels cost?**

The cost of purchasing and installing solar panels has come down considerably over the last 10 years. The cost of a solar PV system depends on a range of factors including the hardware chosen, the size of the system, accessibility of the roof or site, and the installer used. Broadly speaking home PV systems should range from around €1,500 - €2,000 per kW installed (ex-VAT), but prices will vary depending on the factors mentioned above.

### **6. Where are solar panels manufactured?**

Most solar panels are manufactured in Asia (primarily in China and Taiwan) but there are also some European and North American manufacturers. The components for solar panels and other hardware used in the installation come from all around the world.

### **7. Are solar panels right for my home?**

There are a variety of considerations when determining whether solar panels are right for your home. Some thought must go into how much of the generated electricity you will use as this will affect how economical it is as a solution for your home. Solar PV systems generate electricity only during daylight hours, predominantly around the middle of the day when you may be at work.

Also, around 75% of the annual energy from a solar PV system is produced from May to September. You need to consider how much of the generated electricity you will use in your home, based on the pattern of generation from the solar PV system, and the pattern of energy usage and occupancy for your house. Without any additional systems, a lot of the generated electricity can be spilled (exported) to the grid, and there is currently no mechanism for homeowners to claim payment for this (see question 2.9).

You also need to consider if your roof is suitable for solar PV considering the age and condition, the orientation of your house, and any potential shading from nearby trees or buildings. The best rooftops for maximizing electricity generation are those that are south-facing, in good condition, and with minimal shading from trees or adjacent structures.

Finally, it is worth considering other options to improve the energy performance of your home, such as insulation, draught-proofing, improved windows, boiler controls, or some other renewable-generating technology. Speaking to a BER assessor is a good first step.

#### **8. Who can install solar panels on my property?**

Finding a competent installer is important. There are currently no formal qualifications mandated that installers must hold, but connection of the solar system must be carried out by a Registered Electrical Contractor.

SEAI's advice would be to contact multiple installers or developers to get a range of quotes. A good place to start is the Renewable Installers Register which identifies installers that have received accredited training.

#### **9. Do I need planning permission to install solar PV on my roof?**

Larger solar PV systems on domestic rooftops will typically require planning permission. Solar PV systems installed in a domestic setting under 12 sq. m (and representing less than 50% of the total roof area) are exempt from planning. Visit the page on conditional planning exemptions for the full details.

#### **10. What will be installed in my home if I purchase a rooftop solar PV system?**

The main components are the solar panels which will be located on the roof area, and the inverter which will be located within your house or attic. The solar panels convert the light into DC electricity, and the inverter converts this DC electricity into AC electricity for use in your home. The solar system will be connected to your main electricity panel ('fuseboard'). Other optional components are an immersion diverter switch, battery, or energy meter (see questions 2.6 and 2.7 for more information).

#### **11. How will the solar panels be fixed to my roof?**

There are several well-proven solutions to connect the solar panels to your roof. Most solutions fix the solar panels above the existing roof tiles on aluminium rails, but some solutions allow for an integrated, 'flush', connection where the roof tiles are removed and replaced with the solar panels. The most important consideration for homeowners is that the water tightness of your roof is not affected by the installation. Installers should not be permitted to drill into roof tiles to connect the PV panels, as this could lead to future leaks in your roof.

#### **12. How can I maximize the amount of electricity generated that I use?**

The simplest way to use a higher percentage of the electricity generated is to design the PV system to meet the electricity demand of the house, although this may mean a very small PV system is installed if demand is low during the daytime.

Another simple measure is to install a 'diverter switch' which diverts any unused electricity to heat your hot water in your immersion tank. In this way, some of the energy generated is stored as hot water, which you can use later.

Finally, a more complicated option is to install a PV system that does not face south but faces west or east. This will provide more energy in the morning or the evening when you have a greater demand to use it. However, an east- or west-facing PV system will generate less energy over the year than a south-facing system.

#### **13. What about a battery storage system?**

This is a more complex way of storing any potential exported electric energy. Adding a battery to your solar PV system means the battery will charge when the PV system is generating electricity that isn't being used, and then discharge when you need it next (normally that evening/night). A battery can increase the percentage of solar PV electricity you use in your house. However, adding a battery to the system will

increase the cost of the PV system, and some energy is lost in the battery during the charge and discharge cycle. A battery can potentially allow you to 'grid shift' where you store power in batteries at a cheaper night rate for example and consume that energy later in the day.

#### **14. What supports are there for solar PV in homes?**

There are SEAI grant supports for domestic solar PV installations. Grant support is available for PV systems up to 4kWp, but this does not limit the size of your installation to 4kWp.

#### **15. Is there a 'feed-in tariff' payment for excess solar electricity fed into the grid by owners of solar PV systems?**

Yes, this is the Clean Export Guarantee (CEG) introduced as part of the Microgeneration Support Scheme (MSS) in 2022. This essentially means that homeowners get paid for the excess energy generated from the PV system that is not used in the home and is therefore exported back into the grid. To avail of this your installer will need to submit an NC6 to ESB networks and you will need to have a smart meter installed. For more information on the CEG, you will need to refer to your electricity provider.

#### **16. Does my rooftop PV system require maintenance?**

PV systems are low maintenance, but not zero maintenance. The most important aspect is to monitor the performance of your system regularly. This could simply be a routine check of your inverter to see that the system is operational (e.g., no red blinking lights) and that the energy meter is increasing each day.

You should get an idea from your installer about how much the PV system should generate each year and see that your system is generating close to that amount. Some suppliers will provide you with access to this information via your smartphone. The most common point of failure is the inverter, which may need to be replaced at some point in the PV system's lifetime.

The solar panels themselves are extremely robust, but consideration should be given to cleaning them every few years to maintain their performance. If you live near the sea or a main road more regular cleaning may be necessary.

#### **17. What is the difference between domestic and non-domestic solar PV schemes?**

The domestic solar PV scheme is only open to homes that have a domestic MPRN. If you have a non-domestic MPRN (your electricity bill for this) you will have to apply for the non-domestic solar PV scheme. This is typically for farms and commercial buildings. There are different criteria and grant values for the non-domestic scheme, please refer to the SEAI website for further information.