

GUIDEBOOK

Join the Plug-in Solar Revolution

Frequently Asked Questions
on Plug-in Solar





CONTENTS

1. What is plug-in solar?	3
2. Does plug-in solar make economic sense?	4
3. How much of my power consumption can I offset?	4
4. How can I increase my return from plug-in solar (i.e. shorten my payback time)?	6
5. How long does a plug-in system work?	6
6. How do I know if my home's electrical wiring is adequate for a plug-in solar system?	7
7. How can I install my plug-in solar system safely?	7
8. Where should I mount my plug-in solar system?	10
9. Is it safe to put a plug-in solar kit on a balcony that is high up off the ground?	10
10. Is my balcony strong enough to hold a plug-in solar system?	11
11. Can I set up my plug-in solar system by leaning it on the ground?	11
12. Do I need to buy the mounting structures, or can I build them myself?	12
13. Can I use a plug-in solar system on a north-facing façade? What about east/west?	12
14. How can I connect my plug-in solar system to the power socket?	13
15. What if I leave on vacation? Should I unplug my system? What if I forgot?	13
16. Is plug-in solar dangerous?	14
17. Can I connect my plug-in solar system to a power strip?	14
18. Can I connect my plug-in solar system to a cable drum?	14
19. Can I combine a plug-in solar system with a rooftop array on the same building?	14
20. Can I install two plug-in solar kits to the same household?	15
21. What are the advantages of flexible panels vs glass?	15
22. How do I dispose of my plug-in solar system? Can I resell it?	15
23. Is it a problem if my panels are on one phase, but my main consumption is on another?	16
24. Is there really a difference buying from a specialist shop?	17
25. Can I connect a battery to my system?	17
26. Do I need a permission to install a plug-in solar system?	17
27. What happens to the power that I don't consume directly?	17
28. Do I need an electrician?	18
29. Are plug-in systems good in general for the energy transition?	18

1. What is plug-in solar?

Plug-in solar has also been referred to as “balcony solar”, “plug-and-play solar” and “do-it-yourself” (DIY) solar. For simplicity, the term “plug-in solar” is emerging as the most widely used.

Plug-in solar refers to a solar panel equipped with an inverter (built-in or separate) that can be directly plugged into one’s home, apartment, shed, cabin, cottage, or business without needing an electrician. This means that you can buy the system, bring it home, mount it securely, and plug it in. The electricity you generate will flow directly into your home and be consumed by any device that requires electricity, such as your refrigerator, your alarm clock, your mobile phone, or your laptop.

Plug-in solar systems are becoming increasingly popular worldwide: they come equipped with a small inverter that makes the solar panel’s output compatible with your standard household appliances.

The systems can also be equipped with a battery, which can help keep the lights on in the event of a blackout, or help you save some of that solar power you’ve stored for use later. Small plug-in solar kits equipped with batteries can also be used in remote villages or communities, as well as in isolated settings such as on boats, in the desert, or in the mountains.

Plug-in solar systems can be installed on a balcony or terrace, set up in your yard, mounted to your fence, attached to the wall or roof of your house, as well as a wide range of other configurations.

There are two important considerations to bear in mind: the plug-in solar system should be safely and firmly anchored (including sufficiently well-anchored to the ground, balcony, or building to withstand strong winds); and second, it should be positioned so as to capture as much sunlight as possible.

There are three principal differences between a plug-in solar system and a conventional solar array:

- First, plug-in solar systems are smaller,
- Second, any surplus they generate is typically not compensated or paid for by the grid operator or utility. If you do not have a battery, any surplus generated will simply go to other users on the network, or be lost.
- And third, you do not need to pay an electrician to set them up.

By cutting out the electrician from the equation, plug-in solar systems can save you a significant amount of time and money, and make it easier for you to go solar.

From the perspective of the grid, plug-in solar systems effectively help you reduce your electricity consumption; because of their small size, plugging one in has a similar effect to unplugging a large appliance from your home like a refrigerator. It decreases the amount of electricity you need to buy from the grid.

2. Does plug-in solar make economic sense?

In most countries, the simple answer is yes. **Solar panels have come down in cost dramatically in recent years**, and 500W panels are now available on the market for as little as EUR 100 as of mid-2024. When equipped with a built-in inverter, a mounting system, and the required cabling, the costs range from EUR 150 – 600, depending on the size of the panel and the manufacturer.

Depending on whether you are in Germany or Denmark (where power prices are over EUR 0,30/kWh) or in Serbia or Bulgaria (where average household electricity prices are around EUR 0,12/kWh), your payback time will differ. The structure of your electricity price also matters: many countries have higher daytime prices, which would reduce the payback time of a plug-in solar system further.

There are three key factors that determine how quickly your investment in plug-in solar will pay for itself:

- How high are your current household electricity prices?
- Which particular plug-in solar system do you plan to buy (i.e. how much does it cost, does it feature a battery, do you plan to buy mounting structures, etc.)?
- How much sun do you get in your region, and
- How much shade will your solar panel(s) be exposed to over the course of the year?

As a general rule, **homeowners installing plug-in solar systems in Germany can achieve a payback time of between 3–4 years, depending on their individual circumstances. In countries like Serbia and Bulgaria, the payback time can extend to 10 years or more, due mainly to the lower electricity prices.**

For an overview of the approximate payback times for countries across Europe, see:

<https://plugin-solar.eu/about/>

3. How much of my power consumption can I offset?

The basic formula to calculate how much electricity your solar system will produce is as follows:

$$\text{(Solar power generation in kWh/year)} \times \text{(your retail electricity rate)} = \text{Savings per year}$$

For this formula to remain accurate, it assumes that all the electricity produced by your system will be consumed in real-time. If you are an average household with a refrigerator, an alarm clock, and other basic appliances, the chances that this is the case are quite high. Particularly if you are installing a small plug-in solar system of 200-400W.

If you are choosing to install a larger plug-in solar system (e.g. 800W) then there are likely to be times when your system's output will surpass your on-site electricity demand, leading to a surplus.

In most cases, that surplus will not be compensated: it will simply flow to other households in your building, or to the rest of the grid.

What does that look like in practice?

Let's calculate the energy payback from a 200-watt plug-in solar panel in a country like Serbia. You can adjust this calculation for your local needs as explained below.

We start with how much sunlight you get at home using the EU's Photovoltaic Geographical Information System ([PVGIS](#)), which is available in five languages. When you click on the map for your location, it will automatically fill in the box for "solar radiation database". Now, fill in the other boxes to the best of your knowledge, using default settings if you are unsure. Under "installed peak PV power [kWp]", enter "0.2" for 200 watts (or 0.2 kilowatts-peak). Finally, click on the button "visualize results", and scroll down to see the tool's findings.

Now, you can see that the database proposes a "yearly in-plane irradiation" for Serbia of around 1600 kWh, enough for a "yearly PV energy production" from a 200-watt panel of around 240 kWh per year.

The average retail power rate in Serbia is around EUR 0,124 (RSD 14) per kilowatt-hour. However, daytime prices in Serbia are higher, and vary depending on how much you consume, rising to as much as EUR 0,25/kWh (RSD 29/kWh).

To be conservative, we can assume EUR 0,12/kWh. 240 kWh at 12 cents per kWh then gives us EUR 28.80 per year (3.371 RSD) – that is how much your system will save you annually, assuming you are consuming all of your solar power in real-time. If your system cost 200 euros, it will thus pay for itself in roughly 7 years and save you over EUR 25 (2.900 RSD) per year after that. If electricity prices rise further, you'll save even more.

If you're interested in a more precise assessment of your system's annual output, you can introduce a number of adjustments. For instance, PVGIS assumes an optimal "slope" of 35° for Belgrade (click on "optimize slope" for that setting in your location). This information is useful if you can set up your panel on the ground and adjust its angle; try to approach the number recommended in PVGIS for your location. If you set up your panel vertically, such as on a balcony, the slope will be 0°, causing a production loss of around 15%, as the PVGIS tool shows. Your 200 W panel now generates closer to 210 kWh per year, not 240 kWh.

Next comes the orientation of your panel to the sun, or its azimuth: is your panel facing east, south, or west? For locations in the northern hemisphere, if your panel faces due south, its azimuth is an ideal 0°. Due east is 90; due west 270. ([Overview](#)) If the panel is ground mounted, try to face it due south.

Shading is another important factor that can have a major impact on how much electricity you produce. It is extremely hard to assess the impact of shading (see question 13), but you should further reduce the assumed output based on your best estimate of shading on your panel.

If we assume a 15% loss from the slope, a 5% loss from the azimuth, and a 10% loss from shading, your panel would now produce closer to 170 kWh a year. Given the price for power in Belgrade above (12 cents), this would be worth EUR 20.40 per year, so the payback time may extend from 7 years to roughly 10 years.

That said, there is one final adjustment to be made.

Real-time onsite consumption means that you consume all of the power you generate. In most jurisdictions, any solar electricity you do not consume immediately is exported to the grid, and whether you get reimbursed for those exports is a matter of national policy.

In Serbia, the average household consumes around 5,000 kWh of electricity annually, equivalent to 570 watts all the time. However, the level varies considerably; it may be very low in the middle of the night but high during the day when more appliances are being used. With a 200-watt panel, a typical Serbian household would likely consume all or virtually all of its self-produced electricity. However, as the system size increases, more power will be generated during the daytime hours, which could occasionally lead to a surplus.

4. How can I increase my return from plug-in solar (i.e. shorten my payback time)?

The following steps can help you optimize your system:

- **Optimize your orientation:** if you use ground-mounted panels, try to orient them due south and angle them at roughly 30°.
- **Reduce shading.**
- **Keep your panels clean** and clear of dust, debris, and snow.
- **Shift your electricity consumption to the daytime** hours (9 am to 3 pm) to better coincide with the solar output (such as by running the dishwasher or washing machine around noon).

If you can consume more power at such times, your plug-in solar system will power more of your consumption and have a greater impact on reducing your power bill.

5. How long does a plug-in system work?

Inverters usually come with a 12-year warranty. According to the German VDMA, the industry association of machine builders which publishes the annual Integrated Technology Roadmap for Photovoltaics (ITRPV), the standard operating life of inverters is 15 years.¹ Solar panels now often have performance warranties of 25 to 30 years, at the end of which they retain 85% of their rated output.

¹ VDMA (2024). Integrated Technology Roadmap Photovoltaics, <https://www.vdma.org/international-technology-roadmap-photovoltaic>

6. How do I know if my home's electrical wiring is adequate for a plug-in solar system?

First, **if you are unsure, check with an electrician.**

In most countries and regions, the electrical wiring in your home or flat will have been installed by a professional electrician. If you are unsure, or if this is not the case, it is advisable to have an electrician check everything to be sure.

If your fuses regularly flick off when you are using large appliances or power tools, this is a sign that you are using your wiring at its limits and should have it inspected. This is an indicator that your wiring may not be suitable for a plug-in solar system. In most homes built in the last 20-30 years, the fuses rarely go off, because the wiring must meet national building electrical codes and is dimensioned accordingly. However, this is not universally the case. Exercise caution in all matters relating to electrical equipment or wiring. **It is not advisable to tamper with the electrical wiring or fuse box in your house due to the high risk of injury.**

Finally, there is the issue of the wires themselves. In most homes, the wiring is located inside the walls and is therefore hard to see. If you are unsure, check with an electrician.

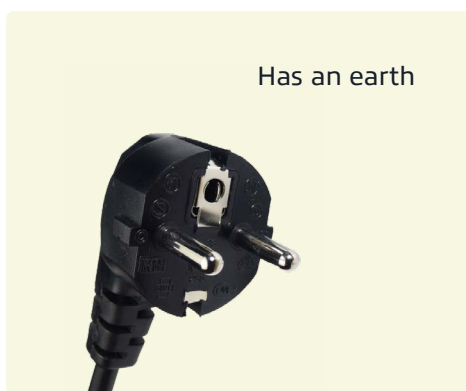
7. How can I install my plug-in solar system safely?

First, please follow the manufacturer's instructions. Make sure you use the original cables provided by the manufacturer. **If your system is provided without instructions in your local language, it may not comply with EU regulations** – an indication that the system may not comply with all safety regulations. This is one reason why it is advisable to buy your plug-in solar system from a reputable supplier, such a hardware store, or a specialist shop.

To be safe, here are a few basic safety guidelines, including some DOs and DON'Ts:

- Make sure that all electrical installations are performed in accordance with your country's electrical codes. When in doubt, consult an electrician.
- DO NOT install a damaged system.
- For the initial installation of your plug-in solar system, DO NOT attempt to install your system in the rain. Wait for a dry day to avoid the risk of an electric shock. Once the system is installed, and connected, it can be left in the rain without problems.
- DO NOT step on your solar panel.
- DO NOT subject your solar panels to any mechanical stress. Solar panels with a glass covering can crack under stress.
- DO NOT allow objects to fall onto your solar panels like rocks, tools, or other heavy objects.
- Be careful when handling your solar panels not to drop them.

- If you are fixing your system to a balcony, or to another elevated structure, use metal cable binders, not plastic ones. Strong winds can dislodge panels and potentially create a hazard for nearby persons or property. Ensure due caution in mounting your system, and be sure to regularly monitor the system and its installation to ensure safety.
- Be aware that installation of a plug-in solar kit carries the risk of electric shock if the system is not handled properly. Simply put, when the sun is shining on your solar panel, it is generating a current. This current can generate a shock if not handled properly. Note that the current flowing from an inverter that is compliant with EU electrical code will be flowing at 230/240 Volts, not 12 Volts or 24 Volts, which entails a significantly stronger shock.
- DO NOT disconnect your plug-in solar system from the inverter when the system is under load (i.e. when the sun is shining on the panel). In other words, ensure that no current is flowing in the wires prior to disconnecting it.
- To ensure that no current is flowing, use a thick blanket or towel to cover the module prior to connecting it, or disconnecting it.
- DO NOT attempt to repair your solar panel or your microinverter. If it fails, contact your manufacturer. Tampering with or opening a microinverter or a solar panel will typically void the warranty.
- If your wiring shows signs of wear, or has been damaged, contact the manufacturer.
- Be aware that the body of the microinverter is a heat sink and can reach a temperature of 80°C. Ensure that the inverter is in a well-aerated space, and that it is not directly exposed to sunlight to avoid generating excess heat. As a rule of thumb, allow a minimum gap of 2cm around the microinverter to ensure proper airflow.
- When connecting your plug-in solar system, make sure to connect the cables linking the inverter to your house or building **first** to ensure earthing. Earthing refers to the process of grounding your electrical system to provide an escape route for any current or surge. Once that is done, you can connect the plugged-in inverter to the solar panel.
- Note that not all European plugs have an earth. In addition, some extension cords may not have an earth either. Ensure that your plug-in solar system is plugged directly into a home or building that has an earth. The visual below shows two examples of a standard EU plug, one with an earth, and the other without:



WHAT IS EARTHING, AND WHY IS IT NECESSARY?

Earthing, also known as **grounding**, is the process of connecting electrical systems, equipment, or metal structures to the Earth. Earthing provides a safe and controlled means for excess electrical current (such as from a fault or lightning strike) to dissipate into the ground, helping protect both your home and any electrical equipment in the process.

Why is earthing necessary?

- ✓ **Safety for people:** Earthing prevents electric shocks by ensuring that exposed conductive parts (such as metal housings of appliances or equipment) do not become live in case of a fault. If a fault occurs, the current flows safely into the ground rather than through a person who touches the equipment.
- ✓ **Equipment protection:** Earthing helps protect electrical equipment from damage due to excess voltage (such as from lightning or a fault). It provides a path for excess current to flow away, which prevents overheating, fire, or damage to the insulation.
- ✓ **Voltage stabilization:** Earthing helps maintain a stable reference voltage in the electrical system, ensuring that voltages across different parts of the system are consistent. This is critical for the reliable operation of sensitive electrical and electronic devices.
- ✓ **Overcurrent protection (circuit breakers/fuses):** Earthing allows circuit breakers or fuses to operate effectively by providing a low-resistance path to the ground. In the event of a fault (such as a short circuit), the high current will travel through the earth, triggering protective devices to disconnect the faulty circuit quickly, and automatically.

In short, earthing serves as a safety backup in case of a fault or emergency.

Since your household or building's electrical system is already connected to an earthing system, plugging your solar kit into the socket automatically provides this earthing function.

In other words, when you plug the solar system into a household outlet, the plug-in solar kit becomes part of the house's electrical system, using the same earthing setup as other household appliances.

8. Where should I mount my plug-in solar system?

It goes without saying that it's a solar system, so you should put it in the sun. Avoid shading: even small amounts of shade from a nearby bush, railing, tree, or other object can significantly reduce your solar panel's output.

However, there are a few additional points to be mindful of when searching for a suitable location to place your plug-in solar kit:

- **Do not** install solar panels in an enclosed space.
- **Do not** install solar panels in locations where they may be submerged in water, either fully or partially.
- **Do not** install your system on a moveable object.
- **Do not** allow any chemical substance (such as oils, solvents, etc.) to come into contact with any part of the solar panels, or the inverter.
- **Do not** operate solar panels near highly flammable gas and vapors (e.g. gas tanks, gas stations).
- **Ensure sufficient rear ventilation** of the module and the inverter.

Finally, regardless of where you mount your system, make sure it is properly anchored. Strong winds can displace solar panels easily, so make sure that your system is firmly mounted.

For more technical information, as well as additional guidance, see: www.pluginsolar.co.uk/wp-content/uploads/2014/12/Plug-In-Solar-Installation-Manual-Adjustable-Mount.pdf

9. Is it safe to put a plug-in solar kit on a balcony that is high up off the ground?

Make sure you purchase modules and mounting systems certified for such heights and install them properly. Regularly inspect your mounting system to ensure that no screws have loosened and no damage has occurred.

On higher floors, flexible solar panels are recommended. They tend to be lighter than glass panels and will thus not exert as much force on your balcony under windy conditions.

Wind speeds at higher floors should not be underestimated. If panels come loose, they can be very dangerous. Likewise, check after a storm whether your panels have weakened your balustrade or if any parts of the mounting system have loosened.

If you plan to use cable binders, make sure to use metal ones, not plastic, as plastic cable binders are likely to weaken over time and break. Make sure your plug-in solar system is well-anchored and properly mounted.

It is recommended, especially for panels installed above the ground floor, that the mounting system is certified for the height at which you plan to mount your solar system.

10. Is my balcony strong enough to hold a plug-in solar system?

If you have doubts about the strength of your balcony, or about the impact of your solar system on your balcony's structural integrity due to wind, vibration, or rattling, then it is advisable to ensure that you have your balcony checked by a professional prior to installation. **In most cases, balconies are designed to hold weight far greater than the weight of a plug-in solar kit**, so the weight itself is normally not the issue. Potential issues that may arise are more likely to relate to the railing or balustrade to which the plug-in solar system is mounted, or to the effect of strong winds creating additional stress on the balcony itself.

Ensure that the panel is well and firmly anchored to the balcony or terrace, and that the balcony/terrace itself is stable and well anchored. A vertically mounted, 500W solar panel can have dimensions of 2m², so it can catch quite a bit of wind. The result could be additional strain on screws, nails, and other pieces of hardware used to anchor the balcony or terrace. **It is advisable to check your balcony or terrace periodically** to ensure that it remains structurally sound and that the parts to which the solar PV system are mounted remain strong enough to support it.

11. Can I set up my plug-in solar system by leaning it on the ground?

A ground-mounted panel is an option, but it is important to ensure that it is well-anchored and cannot blow over in the wind. This is particularly important for "hard shell" solar panels that have a hard frame and a glass front. Such glass-plated solar panels can easily break if they flip over. As such, make sure that the system remains secure and well-anchored.

Also, mounting your system on the ground may generate a host of other issues: if you have chickens, for instance, they may perch themselves on your panels, and poop on them too! The same applies to other farm animals.

A further factor is that panels located at ground level are more likely to experience shading from plants or grass growing on the ground do not shade it.

There are specific mounting structures available that are designed to elevate your panels off the ground, which may be advisable depending on your circumstances. Mounting structures come in wide variety of sizes, materials, and range widely in cost. In some cases, the mounting structures will cost more than the solar panels themselves, so be sure to do your research. If mounting your system on the ground, you may be able to use your own building materials, including wood, or scrap metal. The higher your upfront cost, the longer your payback time (see [Question 2](#)).

12. Do I need to buy the mounting structures, or can I build them myself?

Mounting structures can easily cost more than your solar panels. While this may be surprising, it is a sign of just how significant the cost declines in solar modules have been in recent years. As a result, making the right decision around how you mount your system can make a significant difference in how much money you save, and how quickly you get your money back after your initial purchase.

One of the benefits of mounting your plug-in solar kit on a balcony, fence, or railing is that you may not need to buy an additional mounting structure.

This represents a further benefit of plug-in solar kits that use flexible (instead of hard shell) solar panels: **most flexible systems come with built-in O-rings that make it easy (and low-cost) to mount.** Just make sure to use metal cable binders, and not plastic, as plastic ones may get brittle and break over time.

Another approach is to build your mounting structure yourself (e.g. out of wood, or metal). When doing so, ensure that you allow sufficient space for aeration behind the panels (minimum 2cm) as well as around the microinverter. Microinverters can get hot during operation, so make sure that your mounting structure is designed to allow sufficient air flow around the inverter. **Your inverter should always be protected from rain, snow, standing water, or ice.**

If a panel mounted on a high balcony comes loose in a storm, or in high winds, it can become a hazard to others, and to surrounding property. To avoid this, make sure that your panel is well-anchored and cannot fly away, even in strong winds.

13. Can I use a plug-in solar system on a north-facing façade? What about east/west?

A panel itself can lose most of its output when it is even partially shaded. Power losses can vary from 10% to as much as 70% depending on the unique circumstances.²

Shading can have a significant impact on your power output. However, the type of shading can make a big difference. Does it come from a branch of a tree? Does the tree have needles or broad leaves? Or does the shading come from a standing structure, like a neighbouring building that completely blocks the sun?

The panel does not need to be completely shaded to experience a significant drop in power output; a single tree branch partly shading the panel can make a big difference.

² Maghami, M. R., et al. (2016). Power loss due to soiling on solar panel: A review, *Renewable and Sustainable Energy Reviews*, Vol. 59, pp. 1307-1316, <https://doi.org/10.1016/j.rser.2016.01.044>

The simplest guidance is therefore the best: **seek out the sunniest spot you can find**, with the least shading.

If your balcony only faces, say, east, then you have no choice about how to orient your panels. Your module will then generate electricity earlier in the day – and generally less year-round than a south-facing panel would. North-facing systems should generally be avoided.

14. How can I connect my plug-in solar system to the power socket?

Just plug it into a wall socket outside or run the cable into the building through an opening and plug it in there.

Some plug-in solar systems in the past required that the system be patched into the home's wiring via a special connector, or socket. **Most plug-in solar systems on the market today use a standard plug, and as such, can be plugged into a normal socket in your home**, just like a vacuum cleaner or a toaster.

If your socket is located outdoors, ensure that the area around the socket is clear of debris, and does not allow the build-up of water, ice, or snow.

15. What if I leave on vacation? Should I unplug my system? What if I forgot?

You do not need to unplug your system. A certain amount of electricity is consumed in the building around the clock for stand-by consumption such as refrigerators and alarm clocks. When your power consumption is lower, you simply export any surplus to others in your building, or to the grid.

If you have an off-grid system (e.g. a small home or cottage that is not connected to the main electricity grid), however, most new inverters will automatically detect the absence of load and will automatically shut down.

Without onsite demand to consume the electricity being generated by the plug-in solar kit (such as in an off-grid setting), the voltage within the electrical system will start to fluctuate. **Most modern inverters, particularly the kinds of microinverters used in plug-in solar kits, are designed with safety mechanisms specifically to prevent overvoltage.** If they detect that there is no demand (i.e., no load to consume the generated electricity), they will automatically shut down to avoid damage to the system or to other connected appliances.

This notwithstanding, if you plan to be away for a significant period of time, it is advisable to disconnect your plug-in solar system and to store it in a secure and sheltered environment to protect it from undue weathering, soiling, or from other factors such as rain, snow, or ice.

16. Is plug-in solar dangerous?

As of late 2024, no accidents have occurred in Europe that can be attributed to a plug-in solar system. The only accidents that have occurred were related to non-standard setups, such as when someone attempted to hook up a car battery to the system.

Using a common household plug to connect the system to your household is also safe, despite its contacts being bare while unplugged because the inverter automatically shuts down when it doesn't detect the grid.

If you are in doubt about whether your installation is safe, or about whether your home's wiring is too old or outdated for a plug-in solar system, please consult an electrician.

17. Can I connect my plug-in solar system to a power strip?

No.

DO NOT attempt to connect your plug-in solar system to a power strip. Loads can occur for which the power strip is not designed. Also, most power strips are not designed for outdoor use, and may experience issues when exposed to rain, snow, or ice.

18. Can I connect my plug-in solar system to a cable drum?

No.

DO NOT attempt to connect your plug-in solar system to a cable drum. While cable drums are often designed to handle heavier loads like power tools, they are not specifically designed for use with solar panels. Also, they often contain more than one plug, and may not be designed to handle bi-directional power flow (from the solar kit to the house, and from the house to the power tools you are using).

19. Can I combine a plug-in solar system with a rooftop array on the same building?

Yes, a plug-in solar system is connected to the home's power network on one side of the circuit breaker, while a conventional solar array is connected to the local grid on the other side of the circuit breaker. The key is to ensure that you have enough onsite consumption (or a battery) to consume as much of the self-produced solar power as possible.

20. Can I install two plug-in solar kits to the same household?

In the countries that have regulations governing plug-in solar kits, most include a cap on the maximum allowable system size.

For instance, Austria, Germany, and Italy all allow systems up to a maximum size of 800W. Liechtenstein, Slovenia, and Switzerland have currently set their caps at 600W.

Provided you are staying within the legally allowable cap, installing two plug-in solar kits at the same household is technically possible. Note however, that a larger overall system size will tend to result in more surplus, which means more electricity that you are not consuming in real-time. Given that this surplus electricity is typically not metered, you will not be compensated for it.

21. What are the advantages of flexible panels vs glass?

Flexible panels tend to have lower efficiencies, and therefore lower output, than standard glass-plated solar panels. On the other hand, flexible panels are significantly lighter and less prone to breaking or cracking under strain. A further advantage of flexible panels is that they often come with built-in O-rings that make them easy to mount safely, and avoid the need for expensive mounting structures.

Given their lighter weight, flexible panels may be more suitable for some applications or locations, such as balconies on higher floors. Regardless of which panel type you choose, make sure that they are properly and securely mounted and sufficiently anchored to sustain high winds.

22. How do I dispose of my plug-in solar system? Can I resell it?

Your system can be brought to a recycling centre when it breaks.

There is also a secondary market for solar systems. As such, resale may in theory be possible. However, given the continual improvement of solar panel technologies, owners should not expect more than a small fraction of the original price on the secondary market. In most cases, solar panels and the associated cables, inverters, or batteries are simply recycled at the end of their useful life. Facilities to recycle these materials already exist and are expanding across the EU and beyond.

Note that thin-film panels may cost more to recycle at the end of their useful life, due to the presence of heavier metals like cadmium used in some thin-film panel designs.

For more information on recycling and end-of-life disposal of solar panels, or inverters, in the EU, see:

www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/recycling-from-green-technology

23. Is it a problem if my panels are on one phase, but my main consumption is on another?

No.

The microinverters typically used in plug-in solar systems distribute the electricity generated evenly across all phases of your home's electrical system. This means that no matter which phase your appliances are drawing power from, the solar power generated will be available to offset loads throughout the home. Whether your refrigerator is on one phase and your washer on another, the solar energy will be distributed to power both as needed.

However, household electrical wiring conventions differ widely, sometimes even within a particular country; moreover, different houses within a particular village or region may also have different wiring conventions depending on who designed and installed the system, and where that particular electrician learned their trade.

For a global overview of electrical wiring conventions by country, see the following link:

www.power-sonic.com/blog/single-phase-and-three-phase-voltage-by-country/

A few examples will help illustrate:

For certain countries (e.g. in Eastern Europe) the traditions governing electrical wiring may stretch back to Soviet times, and may differ from the electrical wiring conventions now in place at the EU level. Some countries like the Czech Republic and Slovakia were once part of the same country, and are now two separate countries.

Depending on whether your home or apartment building was built in the 1970s or in the late 1990s, the electrical conventions used may differ.

Similarly, modern household wiring in Germany has three phases, while in the U.S. and the UK, most homes operate on a single phase.

Fortunately, modern microinverters do much of the heavy lifting, and are designed to be able to operate in single-phase as well as in three-phase home wiring. Moreover, microinverters are designed to detect and respond to irregularities, such as fluctuations in voltage levels, and as such, they are designed to keep your home, and your plug-in solar system, safe.

This means that in practice, you can plug your solar kit into any socket, and the energy will be distributed to where it is needed. Just make sure that your socket itself is safe, and free of debris, snow, water, or ice.

If you have doubts about your home or building's electrical wiring, and whether it is suitable for a plug-in solar kit, consult an electrician.

24. Is there really a difference between systems purchased from discounters and those from specialist shops?

Yes. It is recommended that you purchase your system from a specialist shop. Systems purchased at discounters, for instance, or via online clearing houses, may have performance or other quality-related issues, and you may not be able to return them.

If you want to make sure that your system will perform, and that you can return it if there are any manufacturing defects or other issues, it is advisable to purchase your plug-in solar kit from a reputable shop, or from your local hardware store.

25. Can I connect a battery to my system?

Yes, but note that **the use of a battery increases the complexity and cost of your system.** The use of a conventional car battery is not advised. If you wish to connect your plug-in solar system to a battery, make sure to follow the manufacturer's instructions and to get informed first.

Most plug-in solar kits are small in size, and therefore do not need a battery to operate.

26. Do I need a permission to install a plug-in solar system?

This depends on your specific location or region. In most countries, you are required (or requested) to register your system. Also, in most cases, a permission of the building owner is required (if you are not the owner). If your apartment is in a multi-unit residential building, you may need to obtain permission from the building manager or from the other owners in the building.

If you are in a historic district or a neighbourhood with special architectural or heritage status, further regulations and restrictions may apply.

27. What happens to the power that I don't consume directly?

Any power you do not consume immediately will be exported to the grid, or to other homes or businesses located within your building.

Since the output of a plug-in solar system is quite small, separate metering arrangements that would enable you to be compensated for that surplus are uncommon. Compensation for surplus power is typically reserved for larger household solar systems (e.g. from 1kW to 20kW in size).

In most cases, however, your surplus electricity will still have a positive effect, as you are likely to help offset more carbon-intensive electricity elsewhere on the grid.

28. Do I need an electrician?

No, a plug-in solar unit is effectively the same as an appliance. It is self-contained, and easy to install. However, you should follow the technical guidelines provided by your manufacturer.

For more technical information, as well as additional guidance, see: www.pluginsolar.co.uk/wp-content/uploads/2014/12/Plug-In-Solar-Installation-Manual-Adjustable-Mount.pdf

If you are unsure about installing your system safely, consult a professional.

29. Are plug-in systems good in general for the energy transition?

Yes, **plug-in solar systems can make a small but significant contribution to the energy transition**, reducing the amount of non-renewable energy sources needed to keep the lights on.

Consider the case of Germany: if all of the suitable balconies in the country had an 800-watt system (currently the largest allowed in Germany), they would produce roughly 13 Terawatthours (TWh) of electricity, enough to power the entire city of Berlin – without taking up any additional space or land. And this is just the balconies.

If one considers the fact that plug-in solar systems can be mounted on the side of sheds, barns, on fences, or simply leaned up against a house or building, the contribution that plug-in solar systems can make to the energy transition can be even greater.

For countries with lower electricity demand, it is conceivable that plug-in solar systems could meet 5-10% or more of the country's total electricity needs, thereby helping mitigate the need for costly new investments in grid infrastructure or in centralized power generation.



Plug-in solar systems are a quick and easy way to help you save money on your electricity bill.

Millions of households across Europe and beyond are starting to buy plug-in solar kits. Such systems can be installed without an electrician, and reduce the amount of electricity you need to buy from your local electric utility.

Make sure your plug-in solar system is well-mounted, and secure and try to place it to maximize the amount of direct sunlight it receives. Such solar systems will still produce electricity when shaded by trees or buildings, but significantly less than if they are placed in direct sunlight. Similarly, make sure your plug-in solar system is free of dust, and snow.

With your own plug-in solar system, you can reduce your power bills, and make a small but important contribution toward a more sustainable world.

www.plugin-solar.eu