

Can I Charge my Electric Car with Solar Panels?



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The short answer is - Yes! It's a smart and eco-friendly way to power your car.

You can easily integrate your home's solar panel storage system into an EV charger. EVs at home take around 7 to 9 hours of grid electricity, with solar systems you can effortlessly charge your EV off-grid.

You can charge your EV at night using the solar energy stored in the battery bank over the day. Make your home Solar EV-ready to cut costs and reduce carbon emissions.

Keep reading this blog as we guide you to charge your electric car with free and clean solar energy. We will discuss what needs to be taken into account to drive clean without range anxiety.

How Solar EV Charging Works

The solar energy produced by the panels is stored, converted, and discharged using a combination of inverter, charging box, and wires.

The size of your rooftop solar system should be large enough to account for EV charging. An optimally sized solar system, paired with a compatible charging station ensures lossless energy transfer.

You can also directly route the solar energy to power your car using a charging port. However, direct charging from solar panels is time-consuming, so it's best advised to save solar energy using battery packs. This way you solve the solar panel's power output invariability and sunlight hour limitations. Although, investment in battery packs is the most expensive part of an off-grid solar system.

Household grid-tied solar charging gives you the option to prioritize powering the household appliance first, any leftover solar energy will charge your car's battery. However, you can opt to make a standalone off-grid charging system for the car alone or distribute the base load based on your liking.

Using solar energy as a base load for both EVs and households may put an additional load on the existing infrastructure. It's advisable to consult a qualified electrician to assess the capacity of your home's fuses, cables, and connections.

The goal is to maximize the energy utilization of solar energy using a combination of compatible peripherals. Additionally, careful implementation of installation prerequisites and compatible adjustments to the existing solar panel system ensures a safe and seamless charging experience.

How Much Electricity Does an EV Consume?

You can get a good starting point for estimating your EV daily consumption by understanding factors affecting consumption. Battery Capacity, Driving habits, Weather conditions, and terrain affect the consumption. You can integrate these factors to find the average consumption.

To determine your EV's daily energy consumption, follow these steps:

1. EV Battery Capacity

Let's take the example of the Tesla Model 3, the trims vary with their battery capacity. The Long Range version boasts a larger 75 kWh battery. The Standard Range Plus has a 54 kWh battery, the charging capacity of Solar Panels will differ in both trims.

Battery consumption varies depending on the climate, driving habits, infotainment, and HVAC usage. User behavior also makes a huge difference, turning heat seaters ON over air conditions saves your battery giving you extra miles.

Also if you have upgraded your battery, For example upgrading to a larger LFP battery (variant E6LR) affects the charging time.

In some cases, a third-party app in the TESLA OS can drain the battery fast. Take account of these factors to determine the charge required for minimal drive from battery-draining activities.

It's about finding the optimum curve to exploit the best of both the solar panel system and battery management to make your Solar EV-ready infrastructure work.

2. Estimating the Daily Energy Consumption

Your daily commute range decides the energy required to charge the Tesla 3. A daily commute of 30 miles will consume less energy compared to a 100-mile trip. If you drive your EV for short trips, consumption and charging won't be much of a deal.

- **Daily Energy Consumption (kWh) = Commute Distance (miles or km) * Energy Consumption per unit distance (kWh/mile or kWh/km)**

The Tesla Model 3 Standard Range Plus has an average consumption of **25 kWh/100 miles** and **29 kWh/100 miles** for the Long Range AWD. (EPA Reports). We will only consider the average consumption of Standard Range Plus.

- **Per-mile consumption = 0.25 kWh/mile**
- **Calculating the Daily Energy Consumption (kWh) = 0.25 * 30**
- **Daily Energy Consumption (kWh) = 7.5 kWh**

Therefore, for a 30-mile commute, the Tesla Model 3 Standard Range Plus would consume approximately **7.5 kWh** of energy, considering the EPA data with charging losses included.

However, if you drive frequently with high HVAC and infotainment usage, you should consider determining the daily consumption and drive distance to align with the solar panel size and number.

Most EVs come with detailed consumption details, you can easily find the estimates using [free online resources](#).

Now that we have the Daily Energy Consumption data, it can be used to determine the number of solar panels needed to generate 7.5 kWh.

Factors Affecting Home Solar Panel Power Generation

Solar Panels deliver the best output under optimum conditions. Apart from expanding your solar panels, you can maximize energy production by adhering to best practices. PV modules also differ based on their design and maintenance delivering varying performance.

To build a sustainable and energy-efficient solar-ready charging station, consider these factors:

1. Solar Panel Wattage

Solar Panel wattage is the power output capacity of the panel, it is measured in watts (W) or kilowatts (kW). Panels with higher wattage generate more electricity under optimal conditions. It's better to balance the trade-off between panel efficiency and available roof space when selecting solar panels.

2. Weather Condition

Contrary to popular belief, heat build-up in solar panels produces less electricity. Solar panels have negative temperature coefficients, something you should consider when calculating the total energy generation. Also, excess heat or not maintaining the optimum temperature (25C for most panels) reduces the power generation by 25%.

3. Sunlight Hours

Sunlight hours refer to the duration solar panels receive sunlight to generate electricity. Sunlight activates photons in the panel, the excited photon generates electricity. Solar panels must receive sunlight for the maximum period possible.

Sunlight hours vary with region, equatorial regions enjoy extended periods of sunlight hours than other regions.

The number of sunlight hours influences the amount of energy that solar panels can generate. Sunlight hours typically peak in summer and are lower in winter. Considering the seasonal variations gives accurate energy generation data.

4. Roof Orientation

Place your solar panels facing south to capture maximum sunlight. Tilt the south-facing solar panel to about a 30- and 40-degree angle. This way the panel produces the most energy.

Selecting solar panels by keeping these factors in mind helps in resource utilization and gives a complete picture of energy generation. You can easily troubleshoot or calibrate the energy production process. The next important step is calculating the number of solar panels your EV needs to go about your usual chores.

How many Solar Panels do I need to charge my EV?

If you have an off-grid solar panel system installed, the first step is to determine if it has sufficient capacity to handle EV charging. You can add more panels to generate sufficient energy to charge EVs.

In our example, the Tesla Model 3 Standard Range Plus consumes approximately 7.5 kWh of energy for 30 miles. Let's calculate other data related to solar panels to find the exact numbers.

To estimate the number of panels, follow these steps:

1. Find your location's daily sunlight hours:

You can look online using the search string "[location] average daily sunlight hours". Many weather websites or solar resource maps can provide this data. You can also consult a local solar panel expert to get accurate data. Let's assume your location gets 5 sunlight hours.

2. Choose a Solar Panel Wattage:

Solar panels come with different wattage depending on budget and roof space. Off-grid solar systems prefer monocrystalline panels, known for high efficiency. Power output is greater in high-wattage panels but comes with high upfront costs. Standalone or Off-grid systems concentrate more on maximizing energy production. Panels with 300 or 400 kilowatts are sufficient to build a Solar Ready EV charger at home. In our case, let's assume we finalize a 400 kilowatts panel.

3. Calculate the required system capacity (kW):

Dividing the daily consumption (7.5kWh) by the number of sunlight hours(5) gives the required system capacity. Multiply by 1.15 to add a buffer.

- Required system capacity (kW) = $7.5 \text{ kWh} / 5 \text{ hours/day} * 1.15 = 1.69 \text{ kW}$

4. Estimate the number of panels:

- Number of panels = Required system capacity (kW) / Panel wattage (watts)
- Number of panels = $1.69 \text{ kW} / 0.4 \text{ kW/panel} = 4.2 \text{ panels}$ (round up to 5)

You will need 5 panels of 400 wattages to charge your EV (Tesla 3 standard range) off-grid, accounting for variations in sunlight intensity and energy losses in the charging process. This is sufficient to commute a distance of 30 miles daily.

Is a Specific EV or Charging Station required for Solar?

You charge the EV using home ESEV, their rating and specifications affect the charging period. Home chargers are constantly improving, once you have zeroed in on your panel number and modules, the second most important step is to select an appropriate home EV charger.

If your daily commute is more than 100 miles, it's imperative to pair your solar EV charging system with a superior ESEV that speeds up the charging process. Advanced EV chargers perform bidirectional charging by communicating with your solar system. It schedules charging sessions based on solar availability and energy demand.

Conclusion

Using Solar Energy to charge your EV makes you independent from grid electricity, further reducing emissions. You chose a cleaner and greener alternative over fossil

fuels, without emitting greenhouse gas or pollutants. By converting sunlight into electricity, you eliminate fuel costs and electricity bills associated with EV charging. EV adoption will increase in the future, with it also increasing the reliance on grid electricity more than before. The strain on the grid during peak demand periods is expected to intensify. Solar EV chargers might emerge as a more sustainable and resilient solution, ushering decentralization of electricity.