

# Solar panel backup system

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The difference between the two systems is that SolaX is a DC-coupled system, with a single "hybrid" unit serving as the inverter for the solar PV and the inverter/charger for the battery. Powerwall 2 is AC-coupled and so is completely separate from any solar system installed.

Solar panels produce DC electricity. DC is also used to charge the batteries. DC electricity produced by the solar panels can therefore be charged directly to the battery with minimal losses. DC electricity is only converted to AC when there is a load needing to use the electricity on site, or when the battery is full, in which case any excess solar will be exported to the grid.

The disadvantage of DC-coupling is that round-trip losses (circa 10%) for any electricity stored in the battery will happen before the output of the solar system is measured by the generation meter. This only really matters if your system is registered under the Feed-in Tariff scheme - so it doesn't apply to new systems. But it will impact the subsidy income earned by existing systems. These are generally better off with Powerwall 2...

As well as reducing losses, the SolaX system has the advantage of reducing the installation cost when solar and battery are installed together, since a single unit serves as the inverter for both the solar and the battery. SolaX may be a good choice if your current solar inverter needs replacing, as it gives a cost effective means of adding battery storage at a later date. But be aware of the potential loss of subsidy income if you are on a high Feed-in Tariff rate.

DNO permission is currently required for any battery system that will operate in "island mode", regardless of size. Battery inverters must be certified to G98/G99 standard as for solar inverters. G99 fast track applications (for systems which are G100 compliant such as Powerwall 2) are only possible for non-backup operation.

When the grid goes down, solar electricity either has to be used immediately on site, or it has to be used to charge the battery. There is nowhere else for electricity to go. If the battery is full and there is insufficient load to use all of the solar electricity, the solar system has to be "powered down" and if necessary shut down altogether (until the load increases or batteries can be charged again).

For DC-coupled systems, such as SolaX X-hybrid, the solar system size is determined by the hybrid inverter rating - the maximum size being 5 kW (allows up to 6 kWp DC panel rating). To regulate the solar output in backup mode, the inverter shifts its operational point so that it draws less power from the solar panels, shutting down if necessary.

Powerwall 2 allows you to connect non backup loads. This could either be a whole distribution board or it could be a single load such as an electric car charger. It would be a shame to wake up to a power cut only to find the car had drained all of your back up power...

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To achieve partial backup with SolaX, two different distribution boards would need to be installed, only one of which would be islanded in a power cut, alongside the solar and battery. In the schematic below, loads connected to the Secondary Distribution Board would not function in a power cut:

Our dedicated Tesla Powerwall page lists some typical loads for household appliances. By multiplying each kW load by the number of hours you need each load to function in a power cut, you can then get an idea of how much capacity in kWh you need to reserve. If you reserve 30% of your Powerwall 2 (4kWh), then you should be able to watch TV, use your laptop and keep the lights and freezer working for almost four hours, whilst enjoying a few cups of coffee in the process.

Whilst most solar panel backup systems switch automatically to backup mode in a power cut, the switch will not always be to "UPS" (uninterrupted power supply) standard. With Powerwall 2, in general you won't notice the switch (except via a notification on the Tesla app), but don't rely on the seamlessness of the system if you have critical loads requiring seamless backup e.g. life support equipment.

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