

Battery Guide

SOLAR POWER SYSTEM WITH **ENERGY STORAGE SOLUTION**

ENERGY STORAGE

ENERGY STORAGE

thium ion battery system

battery system

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Introduction

Investing in solar battery is a major decision for Australian families, whether that's with a new or existing solar PV system.

Taking the time to read and learn and ask the right questions will ensure that you'll ultimately make the right choice. After all, there is no 'one size fits all' nor the single preferred brand.

Through reading this guide, you'll know more about battery storage than most Australians, be able to identify the specialists from salespeople, tier 1 solutions from lower quality ones, and be confident you're paying the right amount of money for a properly-sized battery storage solution for your home.



Benefits of shifting to solar battery

1. Store unused solar energy for later use and save

When installing solar panels on your roof, your solar power system will generate electricity when the sun is shining. During that time, this electricity will be used to power your home, and all the excess energy not being used will typically be exported back to the grid. With battery storages, you're able to store excess solar energy for later use as opposed to sending and selling it to your retailer for a low feed-in tariff. Using your own generated electricity helps you continue to save on your electricity bills and maximise your initial investment in solar PV.

2. Energy security and control during blackouts

For regions susceptible to blackouts from extreme weather fluctuations or natural disasters, switching to smarter energy with an energy storage device or retrofitting your existing solar power system means avoiding power outages and increasing your savings on your electricity bill. During a power outage, you are able to fall back on your battery storage to power your home with any energy that's been previously stored.

3. Boost in environmental impact by using more clean energy

Since most of the excess solar is being stored in the battery and used when the sun is no longer out, you are reducing your carbon footprint even further because you will be using the energy from the battery before buying electricity from the grid.

4. Prepare for the future of smart cities and the shared energy economy (micro-grids) sharing future

Microgrids are a growing segment of the energy industry, representing a paradigm shift from remote central station power plants toward more localised, distributed generation—especially in cities, communities and campuses. Microgrids provide efficient, low-cost, clean energy, enhance local resiliency, and improve the operation and stability of the regional electric grid. They provide dynamic responsiveness unprecedented for an energy resource. These solutions are already rolling out to certain communities and will likely be the future. By switching to smarter energy now, you will be preparing your home for this shared energy economy future.

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What's the difference between AC Coupled and DC Coupled Solar Battery System?

All solar power systems with battery work on the same basic principles and require a hybrid inverter. Any excess energy from the solar panels is stored in the battery. When it comes to the way your solar panels, batteries and inverters are wired together, there are two main options:

AC Coupled Solar Battery System

DC Coupled Solar Battery System

Both works exactly the same way, but the difference lies in the path electricity takes once it is produced by the solar panel.



AC Coupled Solar Battery System

In an AC-coupled system, DC electricity from the solar system flows from the panel to your inverter converting the DC to AC electricity.

This AC electricity now flows into your home appliances and any excess electricity that is supposed to go back to the grid will be redirected to another inverter that transforms the AC back to DC to be stored in the battery.



Key Benefits

Ease of installation:

Especially for retrofit storage installations when you already have a solar power system and would like to add a battery. Easier installations require less labor and time for solar installers, which often means a lower upfront cost.

Drawbacks

 Electricity produced by solar will have to be converted three separate times before it can be used:

The process of converter DC to AC and AC to DC results in a small efficiency loss as most inverters have efficiency losses of about a few percentage points.

DC Coupled Solar Battery System

In a DC-coupled solar battery system, DC electricity from the solar flows from the solar panels to the battery through a charge controller which is usually in-built most hybrid inverters.



Key Benefits

More efficiency:

DC-coupled systems are more efficient that their AC-coupled counter parts as they only convert the electricity from DC to AC once. You also only have one inverter in your solar battery system.

Drawbacks

Expensive:

DC-coupled options are more expensive upfront as it takes longer to install.

Understanding Battery Conditions terminology

Having a battery also means understanding the technical terms associated to it. This section describes some of the variables describing the present conditions of a battery.



State of Charge (SOC) (%)

An expression of the present battery capacity as a percentage of maximum capacity. SOC is generally calculated using current integration to determine the change in battery capacity over time.



Depth of Discharge (DOD) (%)

The percentage of battery capacity that has been discharged expressed as a percentage of maximum capacity. A discharge to at least 80 % DOD is referred to as a deep discharge.



Terminal Voltage (V)

The voltage between the battery terminals with load applied. Terminal voltage varies with SOC and discharge/charge current.



Open-circuit voltage (V)

The voltage between the battery terminals with no load applied. The opencircuit voltage depends on the battery state of charge, increasing with state of charge.



Internal Resistance

The resistance within the battery, generally different for charging and discharging, also dependent on the battery state of charge. As internal resistance increases, the battery efficiency decreases and thermal stability is reduced as more of the charging energy is converted into heat.

What's the difference between Lead-acid and Lithium-ion solar batteries?

While there are various types of battery technologies currently available on the market and the two main types of battery that are readily available on the market at the moment are Lead Acid and Lithium-ion batteries. We recommend Lithium-ion batteries instead of Lead Acid as the latter is mainly for off-grid systems.

Here is a summary on each type:



Lead acid



PROS

- Reliable
- Cheap and cost effective

CONS

- Requires regular maintenance
- Low depth of discharge
- Short lifespan



Lithium Ion



PROS

- No regular maintenance needed
- Higher Depth of discharge
- Longer lifespan
- High power density

CONS

Expensive

Low voltage battery vs high voltage battery

Low voltage (LV) battery is generally 42.0 volts – 58 voltages and charges at a higher current.

High Voltage (HV) battery is generally between 120-450 volts and charges at a lower current.



LV Battery

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PROS

- Easier to install and upgrade
- Better for off grid applications and large battery banks with medium to low demand

CONS

- Take up more space and more connections
- Low voltage systems tend to have trouble covering quick, startup loads



HV Battery



PROS

- Systems are able to charge and discharge faster and can cover those quick demand surges from starting equipment
- Better for peak shaving applications where the battery is utilized every day

CONS

 Normally up to 3 batteries can be connected in parallel, limited ability to increase the battery size compared with LV batteries



How to choose a solar battery

You can select any battery you like that are listed on the Clean Energy Council Approved Battery list.

When choosing a battery, we must look at the brand of the inverter first. Not every inverter is compatible with all the batteries as the inverter must be able to communicate with the battery. The battery manufacturers and inverter manufacturers each chose several partners that they wanted to work with and get the communication between the hybrid inverter and battery inverter right.

Each battery manufacturer will have a list of hybrid inverters that they are compatible with and vice versa.

For example, BYD Battery box is compatible with Goodwe and Fronius hybrid inverters while the LG CHEM RESU Prime is compatible with SolarEdge technologies.

What are the different types of solar battery solutions?

In Australia, there are a range of battery storage solutions available. Below are four popular brands within the residential market. At Energis, we always suggest speaking to an Energy Solutions Specialist to ensure your battery storage solutions works harmoniously with your solar PV system.





BYD - Battery Box



Tesla – Powerwall





LG Chem - The LG CHEM RESU Battery





How to select the right size of battery for your home

Shopping for the right battery size can be a bit overwhelming. A part from the brand and inverter compatibility, there are a lot of options available on the market. To help you choose the best battery with your solar power system, we have broken down the key factors you should keep an eye out for.

Battery Capacity Rating

A typical homeowner with a normal solar power system will not be home during the day and thus, most of their energy will be fed back to the grid. If they had a battery, they could store that energy and use it during the night. So ask yourself that question; do you use mostly your electricity during the day or at night. If you are also looking to power your home for an extended period, look for batteries with high-capacity ratings. The higher the capacity of the battery, more excess energy from the solar can be stored and used during night time. The battery capacity rating is usually measured in kilowatt-hours, kWh.

Battery Power Rating

If you want to run multiple appliances at once, purchase a battery with a high continuous power rating. The power rating tells you how many and which appliances can be run simultaneously. Solar batteries will usually have two power ratings: the continuous power rating and peak power rating. The continuous power rating is how much electricity the battery can put out continuously (hence the name) for appliances that need a constant power supply, like your refrigerator. While the peak power rating is the maximum amount of electricity a battery can release for a short period of time, which allows you to keep appliances on that need a burst of power to get up and running, like an air conditioner. The power rating is usually measured in kilowatt, kW.

Round trip efficiency

It is the amount or energy that that the battery can deliver compared to the amount of energy injected into it. In other words, it is the efficiency of the battery. For example, your solar panels send 10kWh of energy into your battery but only 8 kWh of the battery can be stored and used. Meaning 2 kWh were used by the battery's control system to store and release the energy, making the battery round trip efficiency rating 80%. We recommend going for batteries with 80% efficiency rating or higher.

Battery life cycle

As you charge and discharge a battery; that is, using it; it loses its ability to hold charge. The battery life cycle is how many times the battery can be completely charged and discharged. When shopping for batteries, look for ones that are warrantied to operate at least 70% of their original capacity after 10 years, or 10,000 cycles, whichever comes first. With a typical 6.6kW system, we would recommend having a battery with a minimum capacity of 10 kWh.

How much will I save off my electricity bill now that I have a battery?

Every household is slightly different from the daily amount of energy consumed to the size, roof orientation to how much sun hours it gets exposed to.

As an indicative guide, refer to the table below to see how much energy savings can be achieved for a 3.9kW, 5.46kW and 6.63kW solar power system:

System size in kW	3.9kW	5.46kW	6.63kW
Avg Daily Production in kWh in Victoria	14.82	20.75	25.19
Avg Monthly Production in kWh in Victoria	450.78	631.09	9195.84
Savings with 50% onsite consumption	\$811.40	\$1,136.06	\$1,379.15
Feed-in tariff with 50% export	\$75.73	\$106.02	\$321.85
Estimated Energy Savings	\$887.13	\$1,242.08	\$1,701.00

*Disclaimer: The savings shown above assume an average yield as per the NETCC guideline. Grid Electricity Price: Peak Rate: 30c /kWh, Off-Peak Rate: 20c/kWh. Assume 70% of the solar power produced is used on site and the remainder fed into the grid. FIT: 6.6 c/kWh. It also assumes a certain usage pattern and other environmental elements which may change or differ from year to year and hence may alter the results. The above projections should be used as a guide only.

Now let's compare the savings with battery. The energy production is exactly the same.

System size in kW	3.9kW	5.46kW	6.63kW
Savings with 50% onsite consumption*	\$887.13	\$1,242.08	\$1,701.00
Savings if 100% excess energy stored for onsite consumption	\$1,042.59	\$1,459.76	\$1,772.12

*Disclaimer: The savings shown above assume an average yield as per the NETCC guideline. Grid Electricity Price: Peak Rate: 30 c/kWh, Off-Peak Rate 20c/kWh. Assume 70% of the solar power produced is used on site and the remainder fed into the grid. FIT: 6.6 c/kWh. It also assumes a certain usage pattern and other environmental elements which may change or differ from year to year and hence may alter the results. The above projections should be used as a guide only.

**Disclaimer: The savings shown above assume that 20% the surplus of energy is being stored in the battery.

To find out what system and battery size you need, use our calculator in the link: https://energis.com.au/energy-storage-calculator/

BONUS Checklist: Choosing the Right Installer

When choosing a solar installer, it pays to do a little research. The Clean Energy Council recommends choosing an Approved Solar Retailer who has signed on to the Solar Retailer Code of Conduct and only uses designers and installers who are accredited by the Clean Energy Council.

Below is a checklist we recommend using to assessing for a quality, reputable installer:

New Energy Tech (NETCC) approved retailer and installer

Using NETCC approved battery



Track record of commercial installations in your state. Given the nature of commercial installations being more complex, installers who have experience in the commercial and industrial or even government sector can be considered as capable of delivering quality installations

Average Google review of 4+ with realistic written reviews

Local office with in-house teams of engineers and technical support people to service your calls

ISO Certified e.g.

ISO14001 - Environmental Management System ISO 45001:2018 - Occupational Health Management System ISO 9001:2015 - Quality Management Systems

Affiliation with any other Councils, Industry bodies or Organisations that are credible e.g. Electric Vehicle Council, Chamber of Commerce, etc.

Ask for references and receive them within a reasonable timeframe

Assess past installations: When looking at case studies and past installations from an installer you're considering, use the guide below to spot the difference between a good and a bad installation. SEE NEXT PAGE.

What constitute to a good quality battery installation?

Energis performs high quality installations for battery storage system.

- Solid experience in residential and commercial battery storage system installation.
- Good quality products used for installation.
- NETCC accredited designers and experienced engineers designed the system to meet the client's needs.
- Battery installation considers the environmental factors such as reducing the effects of weather and rain, avoiding the direct sunlight.
- IP rating of battery (IP55 or IP65 is suitable for the location.
- Reliable mounting system for battery: concrete foundation constructed to mount the battery as required.
- Nice and tidy cable management with cable tray required for commercial installation.
- Battery system installation meets the Australia Standards AS5139, AS3000 and AS/NZS 4777.
- Proper safety signs placed for the battery system.
- Proper training and user manuals provided for the customer.







SOURCE

*Energis Small commercial battery storage design and installation for Medical Clinic in Ballarat - 160kW Solar with 88kWh Battery storage between 3 sites.

FAQs

I want to buy a new Solar PV system but would like to add a battery later on?

If your inverter is a hybrid inverter, you can add a battery at any time. Bear in mind, by the time you purchase and install your battery the inverter might be obsolete.

What happen to any excess energy if my battery is full?

If your battery is full and your solar power system is producing more that you are consuming, the excess will be fed back to the grid.

What happens on a cloudy day if my battery is not fully charged?

On a cloudy day when there is not enough light to produce electricity, you will use electricity from the grid. If you are consuming more energy than the Solar can produce, your battery will not be charging unless otherwise.

Will having a battery ensure that I have power during a power outage?

A standard solar battery system does not provide backup power when a black out occurs. However, some hybrid inverters are designed to provide you with backup power because they can disconnect the electrical circuit, that was configured to be backed up from the grid.

Does the orientation of the roof affect whether or not a home can successfully install a solar product?

Although it is optimal to install solar products on the north-facing side of a roof, it is also possible to install a solar PV system on the east or west facing side of a roof, as long as there is sufficient space. However, this will not produce the same results as a north-facing installation.

Can I charge my battery from the Grid?

In emergency circumstances where the battery has to be forcefully charged, the inverter will use electricity from the grid to charge the battery when there is not enough solar. Normally, the inverter will charge the battery only from the Solar.

I already have a Solar PV system, can I just add a battery?

If your inverter is a hybrid inverter, then Yes. If not, we have different solutions for your needs: Would you like to keep your existing solar? Then, we can retrofit your system as an AC coupled system with battery. We can also replace your existing inverter with a hybrid inverter ready for a battery.

What if I have micro-inverters and want to get a battery?

In the case of micro-inverters, the battery will have to be installed in an AC configuration. This is better to install an inverter with an in-built Charge Controller for ease of install, maintenance and save space.



Meet Energis

We practice what we preach





About Energis

Energis is a 100% Australian owned and New Energy Tech-approved company. We have been designing, installing and servicing residents in Victoria since 2013.



We are a New Energy Tech approved seller & 100% Australian-Owned

This accreditation is an indispensable qualification for a business installing Solar PV. Retailers with this accreditation are committed to quality and best practice. We are also proud to be 100% Australian-owned.



Service all of Victoria and Beyond

With a lot of pride, we service the Metro, Geelong, Mildura and Wodonga regions. Our extensive network allows us to deliver Metro pricing to even the most remote areas.



Tier 1 Quality

We only work with the most respected manufacturers and top-quality panel and inverter brands at the most affordable prices. Tier 1 panels offer high-quality standards that have proven to be better and more bankable than the rest of the market. Our products come with locally backed warranties.



Customer focused

At Energis, the sole focus has always been the customer and the outcome they're looking to achieve – whether that's reduced energy bills, less reliance on the grid or making their homes smarter. We bring our customers ease an affordability with the assurance that we'll always deliver top-quality products.



Standing strong since 2013

Energis has always remained consistent in delivering quality installations and customer support for its customers. We've installed some of the biggest projects in Victoria – no job is too big or too small for us.



ISO Accredited and Affiliated with Credible Brands & Associations

Energis holds the following accreditations and is associated with a number of credible membership associations and industry body:

















We only work with the most respected manufacturers and top-quality brands at the most affordable prices.





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