ecogeneration

BATTERY

POCKET GUIDE 2019
MOST UP-TO-DATE STORAGE SOLUTION

MIN 2500-6000TL-XH
- Compact and Light
- OLED Display, Touch Button
- Storage Ready
- Online Smart Service

GBLI6531 Lithium Battery
- Compact Design, Easy Installation
- High Energy Density and Efficiency
- Excellent Safety of LiFePO4 Battery
- DoD up to 92%
Battery storage allows electricity generated by solar panels during the day to be stored for use later when the sun has stopped shining.

Although batteries were first produced in the 1800s, the types of battery energy storage systems that can store solar power and provide electricity to households today are fairly new.

A battery storage system connects to a house in two main ways: DC (direct current) coupled or AC (alternating current) coupled.

A DC-coupled battery storage system is integrated into the solar system. These systems generally have a single inverter that converts the DC electricity to AC to supply the house or feed back into the grid.

An AC-coupled system is separate to the solar system. It connects directly to the house wiring via a dedicated bi-directional battery inverter, using local AC electricity to charge the battery and discharge it directly to the house. Once set up, a battery storage system should operate automatically.

Installing a battery storage system can provide a number of benefits when used in conjunction with an existing or new solar panel system.

A battery storage system can:
• Help reduce reliance on the grid
• Maximise the energy used from solar panels by allowing it to be stored rather than sent to the grid
• Offset the increased cost of power used during peak times, such as during the evenings
• Save money by storing energy from the grid overnight when prices are low to use during peak times when prices are high (this will depend on the power agreement)
• Provide electricity during power outages (this will depend on the system)

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WHAT IS BATTERY CAPACITY?
One important consideration is the useable amount of energy in a battery storage system.

Some manufacturers promote their battery capacity based on the total capacity, for example 10kWh. But all battery storage systems have what is called depth of discharge (DoD).

Depth of discharge is how much of the total capacity can be used. Most battery storage systems cannot have 100% of the total energy drawn out of the battery.

Depth of discharge is expressed as a percentage of the total capacity.

If a 10kWh battery has a DoD of 80%, it will provide 8kWh of usable energy.

Lead-acid battery systems typically have a depth of discharge between 30% and 50%.

Lithium-ion battery systems typically have a depth of discharge of 80% and above.

HOW LONG DO BATTERIES LAST?
Product warranties on battery storage systems vary widely and are generally anywhere from two to 10 years. A battery storage system will often last longer than its warranty but its ability to store energy will gradually reduce over time with use.

The retailer the battery was purchased from should provide a retailer warranty. Warranties vary between retailers including how they define the life of the battery. Some retailers offer a warranty as an 'energy throughput' figure, which means they guarantee their batteries will store and deliver a given amount of energy, no matter how quickly that limit is reached.

Energy throughput for lithium-ion batteries ranges from 4,000 to 6,000 cycles (charges/discharges of the battery) at 80% discharge rate, meaning an expected life of 10 years for high performing systems (if cycled once a day).

Some battery retailers offer a warranty guaranteeing either an energy throughput or a lifetime in years, usually based on whichever limit is reached first.
SPECIALISTS IN HIGH VOLTAGE CONSTRUCTION

YATES ELECTRICAL SERVICES have been providing quality construction services to the high-voltage sector since 2008, delivering some of the most exciting projects throughout Australia. With a highly skilled team of electricians and trade professionals, Yates Electrical Services have the expertise and knowledge to assist in developing large-scale high-voltage projects efficiently and to the highest standard. Visit www.yateselectrical.com for more information.
### The Most Common Ways to Purchase a Battery Storage System

If you are purchasing a battery storage system on behalf of your customer, it’s important to discuss their needs with a system designer. The most common ways to purchase a system are shown as follows:

<table>
<thead>
<tr>
<th>System Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Off-the-Shelf System</strong></td>
<td>• One manufacturer</td>
<td>• Predefined energy and power limits</td>
</tr>
<tr>
<td></td>
<td>• One warranty</td>
<td></td>
</tr>
<tr>
<td><strong>Semi-Customised System</strong></td>
<td>• Customisable</td>
<td>• Extra layer of complexity</td>
</tr>
<tr>
<td></td>
<td>• Flexible energy and power limits can be set</td>
<td>• More than one manufacturer</td>
</tr>
<tr>
<td></td>
<td>• Extra layer of complexity</td>
<td>• More than one warranty</td>
</tr>
<tr>
<td><strong>Fully-Customised System</strong></td>
<td>• Most designer flexibility of all solutions</td>
<td>• Multiple warranty considerations</td>
</tr>
<tr>
<td></td>
<td>• Customisable energy and power limits</td>
<td></td>
</tr>
</tbody>
</table>

### What Different Types of Batteries are Available?

<table>
<thead>
<tr>
<th>Battery Type</th>
<th>Advantages (compared with lead-acid batteries)</th>
<th>Disadvantages (compared with lead-acid batteries)</th>
</tr>
</thead>
</table>
| **Lithium-Ion Batteries** | • Higher capacity and storage  
• Lighter weight and higher voltage  
• Smaller space and environmental footprint  
• Reduced maintenance due to inbuilt battery management systems  
• Longer cycle life and greater depth of discharge | • Cost  
• Possible limitation in operating temperature range  
• Recycling programs in Australia in infancy but expanding  
• Lesser known technology |
| **Lead-Acid Batteries** | • Well-understood technology  
• Relatively cheap  
• Easy to acquire  
• Readily recyclable and have commercial value | • Require regular (albeit simple) checks and maintenance  
• Limited depth of discharge  
(i.e., a lower proportion of the energy stored can be used)  
• Requirement for external venting, which restricts installation locations |
The battery that works twice as hard.

With the SLR500 VRLA, you get twice the cycles of a flooded battery.

Designed to last for 15 years, our latest nano-carbon deep cycle VRLA battery gives you the longevity you want from your energy storage system. With 5,500 cycles at 70% DOD at 25°C, your energy system has the capacity to see you through the next 15 years, no matter what the future holds. And with no need to top up the battery, it's as close to maintenance free as you'll ever get.

To learn more and find out about the support you will receive from our local support team over the life of your SLR500, visit our website.

For enquiries call 1300 364 877
FLOW BATTERY
A flow battery is a type of rechargeable battery where re-chargeability is provided by two chemical components dissolved in liquids. These chemicals are contained within the system and are most commonly separated by a membrane. This technology is akin to both a fuel cell and a battery, where liquid energy sources are tapped to create electricity and are able to be recharged within the same system.

One of the biggest advantages of flow batteries is that they can be almost instantly recharged by replacing the electrolyte liquid, while simultaneously recovering the spent material for re-energisation.

The main limitation with flow batteries is their low energy and power density compared to lithium-ion and lead-acid.

Different classes of flow cells (batteries) have been developed, including redox, hybrid and membraneless. The fundamental difference between conventional batteries and flow cells is that energy is stored as the electrode material in conventional batteries but as the electrolyte in flow cells.

ULTRABATTERY
UltraBattery is a hybrid, long-life lead-acid energy storage device. It combines the fast charging rates of an ultracapacitor technology with the energy storage potential of a lead-acid battery technology in a hybrid device with a single common electrolyte.

UltraBattery is ideal for any variable power application where variable and/or rapid charge and discharge of energy is needed. These include:

• Hybrid electric vehicles
• Managing variability on electricity grids
• Ancillary services for electricity grids
• Smoothing the variability in solar and wind energy signals
• Storing energy from renewables for later use
• Stand-alone microgrids in combination with renewable generation to deliver local power
• Energy storage for residential solar panel installations
• Transport system support
Residential Storage Solution
Innovative AC coupled ESS

- LiFePO 4 AC-coupled battery system
- 2 SKUs: 5 - 10 kWh
- All in one: Integrated monitoring
- Self-consumption & TOU ready
- Max Input power 3.2 KW
- Max Output power 4.5 KW
- Back-up mode (optional)

FROM SOLAR ENERGY GENERATION TO STORAGE.

- Automatic battery Charge / Discharge based on house consumption load

APsystems Australia
Suite 502, 8 Help Street, Chatswood NSW 2067, Australia
Phone: 02 8034 6587
Email: info.aunz@APsystems.com
aunz.APsystems.com
What does battery capacity mean?
Typically, battery capacity is expressed in kilowatt hours (kWh), similar to the way electricity is charged. Some battery manufacturers express their capacity in ampere hours (Ah).

The battery capacity quoted by the manufacturer is an ideal number that is used for comparing batteries. One important consideration is the useable amount of energy in a battery storage system. Some manufacturers promote their battery capacity based on the total capacity, for example 10kWh.

How big are battery storage systems?
A number of battery storage solutions are available. They come in a range of sizes based on the technology they use and the amount of energy they store (typically between the size of a split system air-conditioner and a fridge). Lead-acid batteries tend to be physically larger than lithium batteries.

Where can a battery system be installed?
Some battery storage systems can be wall-mounted while others are floor-standing. Some can be installed inside while others are best suited for outside. Multiple batteries can be installed to increase storage capacity in which case extra storage will be required.

Lead-acid batteries tend to be physically larger than lithium batteries and are best suited to being installed outside or in a garage or basement as they vent hydrogen when charged. Lithium batteries are designed to be wall-mounted inside a utility room, which helps control temperature. It is also important to consider ventilation with inside batteries. Outside batteries will come with a
weatherproof enclosure and will need a suitable place to be installed. They will need to be out of direct sunlight and not adjacent to heat or ignition sources.

**Is battery storage applicable if there is a feed-in tariff?**
An important consideration when installing a battery storage system with a solar panel system is the impact it will have on the existing solar feed-in tariff.

A CEC accredited designer will be able to calculate the potential savings as part of the load analysis and choose a system that is right for the client's needs. Factors such as the size of the system, how much electricity is exported and the feed-in tariff amount will determine the cost savings to the client.

**Will the battery work in a blackout?**
Not all battery storage systems provide backup power. Some will work during a blackout and some may operate following a brief power outage. If the battery storage system needs to work during a blackout, discuss it with the system designer and choose an appropriate product. If an uninterrupted supply of electricity is required, an uninterruptible power supply (UPS) battery storage system will need to be installed. UPS battery systems are typically larger and more complex to install and will cost more than other systems.

If the battery is charged, it will be able to provide power to the home during a blackout. However, there may be a limit to the number of appliances that can be operated during the blackout. This will depend on the rating of the battery storage system. Alternatively, the installer can wire specific appliances so they can be used in a blackout. Some storage systems can power a whole house during a blackout.

Some systems will have a disruption to power (usually a couple of seconds) between the blackout occurring and the system kicking in to supply power. If a customer is looking to go completely off the grid, consult with a CEC accredited designer.

**Going completely off-grid?**
If a client would like to completely disconnect from the grid and supply their entire household with clean power, there are a number of things for them to consider.

- The solar system will need to be large enough to meet the power needs and the battery will need to be able to cover the requirements at all times, including peak times. In most cases, that means a very large solar system and battery storage system will need to be installed
- Large systems can present challenges, including their physical size, town planning regulations and grid-connection requirements. Off-grid systems are more complex to design and install
- Backup will be required by the client if something goes wrong

**What happens if your client moves house?**
It is possible for a storage system to be moved if your client moves residence, in the same way solar panels can be moved. If the product standards change, the battery storage system may no longer meet the new standards and it won’t be able to be re-installed. If the system is moved, it has to be carefully reinstalled by an accredited installer.
Battery storage systems do have some safety risks, just like solar panels or any other major piece of electrical equipment. Provided your system is installed to all relevant Australian Standards and used and maintained properly, battery storage is safe, but it’s important to be aware of the risks so you can manage them safely.

The main safety hazards are:

- The general hazards of electrical wiring
- Chemical, fire or explosive hazards. For a battery system, these are similar to the risks associated with bottled gas or a natural gas service. For this reason, smoking around a battery system is dangerous and it is advisable to check whether the system being installed vents gas
- Non-flammable gases escaping when charging or discharging from lithium batteries may pose a risk to inhaling noxious gases similar to natural gas leaks
- Chemical leakages similar to corrosive fluid in car batteries or household chemical cleaning products

- Small children and pets should be kept away from the battery storage system
- Items should not be stored on top of the battery storage system
- The battery storage system will heat up similar to a laptop but shouldn’t be hot to touch. Like all electrical equipment, battery storage systems emit some level of electromagnetic radiation, within safe limits.

If an incident occurs call 000 immediately. Servicing of the battery storage system should be done by an accredited installer.

SAFETY STANDARDS FOR LITHIUM BATTERIES

The best practice Battery Safety Guide, found at batterysafetyguide.com.au, has been developed by industry and represents the agreed best practice.

The guide requires testing under a range of extreme conditions, such as dropping the battery from a height, smashing it, firing a nail into it, overheating it, overcharging it and short-circuiting the terminals. Batteries need to determine they can withstand extreme conditions such as fire, explosions, leakage, venting of flammable gases or rupture of the casing.

The guide also requires the manufacturer to provide important safety information for end users.

If you are considering the purchase of a lithium battery, ask the retailer to provide proof that it has been tested in accordance with this guide. Alternatively, the CEC’s Approved Energy Storage Devices list only includes batteries that have been independently tested to confirm they meet the necessary electrical safety and quality standards required by the guide. Only products that are listed under their actual brand name and model number are valid.
The lifetime of a battery is strongly dependent on how the system is used. Poor or heavy usage may mean the product doesn’t last as long as the manufacturer’s specifications. The lifetime also depends on ambient temperatures. All battery types should be checked during extreme hot and cold weather to see whether they are still performing as required.

Batteries can be discharged over a large temperature range (-20°C to 60°C) but the charge temperature should be limited for best results.

A system owner’s electricity consumption may also change over time, which can alter the long-term performance and life of the battery storage system.

**SYSTEM MONITORING**

It is important to keep an eye on how a battery storage system is operating. Different manufacturers have different ways to do this:

- Some systems have a display on the battery storage system itself, with indicators such as operating mode and battery state of charge.
- Some systems support a remote display option that can be installed inside the house.
- Some systems can connect to the internet and allow the user to view information on a computer, smartphone or tablet, even when they are not at home.

In addition to monitoring systems provided by your battery storage system manufacturer, third-party home energy monitoring solutions are also available.

**INSPECTIONS**

Depending on which state a system is installed in, a safety inspection may be carried out by a relevant electrical authority. These inspections may be mandatory or may occur on a random audit basis. In some states, the installer is responsible for organising the inspection of a system. The inspection may need to be carried out before the system can be connected to the grid.
WARRANTIES

If there is an issue with the battery storage system while it’s still under warranty, the owner should contact the retailer to have the product repaired or replaced. Contact details should be provided on the warranty documentation. In addition to any contractual warranty, the owner has additional rights under Australian Consumer Law and the relevant state sale of goods legislation.

The ACCC website also has further information on warranties, consumer guarantees and rights to remedies: accc.gov.au/consumers.

WORKMANSHIP COMPLAINTS
The benefit of the owner using a CEC accredited designer/installer is that the CEC can resolve complaints involving workmanship issues that breach the Accreditation Guidelines or relevant Australian Standards by a CEC accredited designer/installer. This only applies to individual tradespeople who hold CEC accreditation and does not extend to retailers.

RETAILER COMPLAINTS
If the owner has a complaint against a company identifying itself as a CEC Approved Solar Retailer, the owner should first contact the company.

If they are not satisfied with the response from the company, they should contact the relevant consumer protection organisation. They can also register their complaint with the CEC who can investigate breaches of the Approved Solar Retailer program. This may result in the retailer having its approval revoked.

WHAT IF THE COMPANY HAS GONE OUT OF BUSINESS?
If the retailer has become insolvent and is unable to be contacted, a complaint can be lodged with the retailer’s administrators. You can find out if a company has become insolvent via the Australian Securities and Investment Commission (ASIC) website or by phoning 1300 300 630. The owner can also contact the local Fair Trading or Consumer Affairs office.

If the manufacturer has gone into administration, a complaint can be lodged with the company’s administrators. The owner may become an unsecured creditor.

COMMERCIAL COMPLAINTS
If the owner has a commercial complaint including warranties, payments and contractual issues, they should contact the relevant Fair Trading or Consumer Affairs office in their state or territory.

ACT: Fair Trading (02) 6207 3000
NSW: Fair Trading 13 32 30
NT: Consumer Affairs 1800 019 319
QLD: Office of Fair Trading 13 74 68
SA: Consumer and Business Services 13 18 82
TAS: Consumer Affairs and Fair Trading 1300 654 499
VIC: Consumer Affairs 1300 558 181
WA: Consumer Protection 1300 304 054

ELECTRICAL SAFETY
If there are concerns about the safety and technical compliance of the battery storage system, contact the electrical authority in your state or territory.

ACT: Planning (02) 6207 1923
NSW: Fair Trading 13 32 30
NT: NT WorkSafe 1800 019 115
QLD: Electrical Safety Office 1300 362 128
SA: Office of the Technical Regulator (08) 8226 5518
TAS: Department of Justice 1300 135 513
VIC: Energy Safe Victoria (03) 9203 9700
WA: Energy Safety (08) 6251 1900
Tomorrow’s Solar Technology

- Global, Tier 1 bankable brand
- Bifacial technology enables additional energy harvesting from rear side (up to 25%)
- Industry leading 12 years product warranty
- Excellent PID resistance
- Certified to withstand severe environmental conditions

Risen Energy (Australia)
Unit 35/15 Ricketts Road Mount Waverley, Victoria 3149
Email: info@risenenergy.com.au  Website: www.risenenergy.com.au
BATTERY RECYCLING AND END OF LIFE

When purchasing a battery storage system for install, ask the retailer whether they have a battery recycling program in place.

Batteries contain harmful and dangerous materials such as acid, lithium and heavy metals (cadmium, cobalt, lead). Batteries need to be managed throughout their lifecycle and their end of life. This includes handling, collection, storage, transport and processing.

When a battery needs replacing, the old battery should be disposed of at a battery recycling station or other suitable site. Batteries that require recycling should be stored safely in a cool, dry place out of the reach of children and pets and all exposed terminals should be taped up.

More information on battery recycling can be found at batteryrecycling.org.au and envirostream.com.au – Australia’s first lithium-ion battery recycler.

STATE AND FEDERAL JURISDICTIONS
As of July 1, 2019, the Victorian Government banned e-waste from entering landfill. E-waste is defined by the Victorian Government as ‘any end-of-life equipment which is dependent on electric currents or electromagnetic fields in order to work properly’. Simply put, e-waste is ‘anything with a plug, battery or power cord that is no longer wanted or useful’. This includes solar panels, solar battery systems and inverters.

BATTERY STEWARDSHIP
The Clean Energy Council has taken a leading role in establishing a body to oversee the implementation of a battery stewardship scheme. The Battery Stewardship Council (BSC) was formed in early 2019, combining government and industry bodies that had undertaken important background work on understanding the markets and the barriers to recycling that need to be addressed in a stewardship scheme. The Clean Energy Council is currently working with the BSC on the design of an industry-led stewardship scheme. For more information on the BSC, please visit bsc.org.au.

SIMPLE STEPS

FOR SAFE AND RESPONSIBLE BATTERY DISPOSAL

1. When buying a battery, find out if it contains recycled content and is recyclable.
2. Learn about the risks of deinstallation and understand your system. Know what to do and what not to do.
3. Plan for safe and responsible management of batteries at the design and Installation stage.
4. Find a CEC accredited installer to advise you on deinstallation.
5. Ensure an accredited recycler is used.
WHY IS IT IMPORTANT TO RECYCLE YOUR BATTERY STORAGE SYSTEM?
Depending on chemistry type, batteries may contain harmful and dangerous materials such as acid, lithium and heavy metals (eg, cadmium, cobalt and lead).

YOU CAN BE PART OF THE SOLUTION
Ensure your batteries are managed responsibly and are recycled or reused, to:
• Enable the recovery and reuse of lead, iron, plastics, aluminium, copper, lithium, cobalt and electrolyte
• Divert toxic and hazardous materials from landfill
• Ensure that batteries are managed safely
• Prevent injury due to contractor training and experience in safe lifting and handling
• Minimise the risk of damage and potential for fire during removal and transport
• Protect system components during de-installation, improving potential for reuse in a second life

IMPORTANCE OF SAFE AND RESPONSIBLE DISPOSAL OF YOUR BATTERY ENERGY STORAGE SYSTEM

<table>
<thead>
<tr>
<th>ENVIRONMENT</th>
<th>SAFETY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling or reuse ensures resources are not wasted</td>
<td>Batteries contain energy and have potential to cause electric shock</td>
</tr>
<tr>
<td>Disposal to landfill may cause fire, releasing highly toxic smoke to the community</td>
<td>Batteries contain matter that could catch fire if damaged</td>
</tr>
<tr>
<td>Disposal to landfill may contaminate soil or water</td>
<td>Batteries are heavy and improper handling can cause injury</td>
</tr>
<tr>
<td>Recycling using accredited recyclers ensures safe recovery of material</td>
<td>Batteries may contain hazardous substances</td>
</tr>
</tbody>
</table>
There are two key concepts to understand:

- **Power** — how fast energy can be supplied (kilowatts or kW)
- **Energy** — how much energy is stored by the system (kilowatt hours or kWh)

A typical house may use around 18kWh of energy a day with a maximum power consumption of 4.5-15kW, although this can vary significantly.

As long as it is connected to the grid, the battery storage system does not need to provide for all the power needs.

Most battery storage systems on the market have a power rating of 2-5kW and an energy rating of 2-10kWh. Multiple systems can be used to scale this up if necessary.

The peak demand will depend on how many and which appliances are used at the same time. Typical maximum power requirements of some high-powered appliances are:

- **Air-conditioner** 2-5+kW
- **Water heater** 3kW
- **Clothes dryer** 2.4kW
- **Electric kettle** 2.4kW
- **Hair dryer** 1-2kW
- **Dishwasher** 1.5kW
- **Washing machine** 1.5kW
- **Microwave oven** 1.5kW
- **Plasma TV** 0.8kW
- **LED/LCD TV** 0.2kW

As a general rule, any appliances that cool or heat will need more power than other appliances.

### BATTERY STORAGE SYSTEM CHECKLIST

Every good install ends with the system owner being given a simple, clear briefing on technology that’s new to them. The checklist below will help new battery owners feel comfortable about their investment and their system.

- Understand what the battery will be used for and the amount of energy available for that use (this is usually less than the manufacturer’s rated total amount of energy labelled on the batteries).
- The owner needs to monitor the system regularly (at least once a month) and know how to read any battery monitoring system that is in place.
- Make sure the owner knows what to check for when doing a visual check or taking meter readings.
- As batteries do not perform well with sudden changes in ambient temperature, on extremely hot or cold days the owner may need to do additional monitoring.
- Ensure batteries are not accessible to children and are vermin-proofed. Do not store items on top of or lean items against batteries or enclosures because they could be a potential electrical fire risk. Suggest installing signs as a reminder.
- Ensure batteries have the correct safety and warning signs for the battery type, and that the owner knows the correct procedures in case of an emergency.
- Keep manufacturer, installer and warranty information to refer to as needed.
Change Your Energy
Charge Your Life

THE COMPACT & POWERFUL ENERGY STORAGE FOR YOUR HOME

LG Home Battery
RESU

- Compact Size & Space Saving
- Reliable Performance
- Proven Safety

Grid-scale  Home  Commercial & Industrial  UPS

With 24 years of experience in the global energy sector, LG Chem is an industry leader in Lithium-ion batteries

www.尕e энергиио.com
BATTERY READY
RESIDENTIAL SMART INVERTERS

SUN2000L-5KTL

SUN2000-5/6KTL-M0

Highly Efficient
98.6% max efficiency

Ultimate Safety
Built-in arc fault protection

Battery Ready
Plug & play battery interface
(Only for residential)

Better Experience
17-25kg light and easy to install

Investment Protection
Full 10 years manufacturer's warranty

*Contact your local distributor for battery compatibility options.
Huawei Technologies (Australia) Pty Ltd.  http://solar.huawei.com/au/  Contact us: au_inverter_support@huawei.com