

Battery Storage Information

As you are aware, there has been a surge in interest in battery storage in homes. We are writing to you to inform of you the aspects of owning a battery storage and the crucial facts before embarking on purchasing a battery system. A battery system is used primarily to offset evening electricity consumption and to make use of Time-of-Use (TOU) tariff which is not widely applicable in South Australia which most household use Single-Tariff.

Retrofitting a PV system:

Battery Inverter Requirement: A battery inverter connected to the battery system is necessary to convert DC current to household AC current, which is a separate unit from a Photovoltaic (PV) inverter. There are 3 options to retrofitting a battery system (to suit 48V battery) over an existing PV inverter:

- Adding a Battery Inverter.
- Replacing with Hybrid Inverter (PV inverter + Battery Inverter in single unit).
- Replacing with Energy Storage System (PV inverter + Battery Inverter + Battery in single unit).

Each bundling restricts the flexibility of the system and generally is less efficient than their specialized counterparts. Modular designs are more flexible in adapting to future changes and making upgrades more viable.

Differences between Low Voltage Battery and High Voltage Battery System

High voltage batteries (350-450V nominal) and low voltage batteries use different types of battery inverter designed to regulate each respective battery.

- This high voltage is a result of stringing multiple lithium-ion cell stacks to form the battery pack. These cells are used in laptop batteries and as such, we believe it is an economic design factor since laptop battery cells are widely available and as such affordable, but it is not a standard large-capacity battery.
- As such, these units, we believe are susceptible to string failure (much like Christmas string lights breaking circuit when one fails in series) within an array. This failure is minimized by load shifting through their battery management system, but the overall efficiency would be compromised resulting an eventually degradation in usable battery capacity. (expected 70% of the original usable capacity after 10-year period, their 10-year warranties at least 60% energy retention). Large-capacity low voltage battery is less prone to this failure.
- High voltage batteries incur less resistance in cabling and conversion to household AC due to lower current flow and as such the system requires less accessories to operate.
- Designing a high voltage battery system requires a battery inverter that is specifically designed for high voltage input. As of writing, the SMA Sunny Boy Storage 2.5 (battery inverter with inbuilt 2.5 kWh battery system) is compatible with high voltage batteries or hybrid inverters: SolarEdge StorEdge (single phase) and Fronius Symo Hybrid (3-phase). As such, high voltage battery system requires special accessories and thus, we are not confident that high voltage batteries would be adopted as an industry standard. Therefore, battery owners are effectively restricted to high voltage batteries due to the use of specialized high voltage battery inverters.
- High voltage system naturally leads to a low current system that would shut-down intermittently to high current spikes (e.g. use of kettle, microwave and hairdryer) and as result there will be periods where batteries cannot accept current flow and this can last up to 1 minute each energy spike.

In short, lower battery voltages offer better battery costs at higher system integration costs, whereas higher voltages turn that comparison the other way around.

Life Expectancy and Cost of Battery Systems:

The growth of battery technology has been slower than general electronic technology in history and it only this year the growing public interest in battery has expedited R&D and as a consequent, prices are starting to drop over the next 5 years.

- Lithium batteries are estimated to last 5,000 full cycles which equates to about 15-16 years of operating life in a typical household. This life expectancy is dependent on the depth-of-discharge (DOD) that is targeted (household is recommended to have 80% DOD), of which lower DOD results a longer lifespan. Therefore, under-sizing a battery system is a detrimental option overall.
- Industry standard of batteries typically covers 10-year limited warranty (parts defect and workmanship) and 60% energy retention after 10 years. Warranty is also dependent on operating conditions.
- The payback period of battery systems is expected of have an average ROI of 10 years in a well-designed system as of current writing, this includes the expected projection of electricity prices of 5% increase per annum.
- Battery Prices are expected to decrease over the next 5 years as more battery manufacturers move into household battery systems and as well as Inverter manufacturers becomes more competitive.
- Energy market is expected to shift to Time of Use tariff as more smart meters are being implemented in households. This means that energy charges would vary dependent on peak hour usage, but it does not mean overall electricity fee would increase.

Conclusion

We recommended batteries in scenarios where there is substantial night-time electricity use and there is adequate excess solar electricity to be stored for night-time use. Otherwise, we believe that the current battery offering imposes a first-adopter premium and not suitable for general households. The current battery standards by Australia Standards has not caught up to the recent technology and therefore battery systems are not recommended as a set-and-forget investment as of now. We believe battery technology would revolutionize the structure of the current electric market and effectively decentralize the system, making grid electricity cheaper in the long run.

We have been designing battery systems for 30 years in homes that has no access to the grid and have customers with systems running for more than 10 years on older technologies and still going strong. Should you have any further inquiries, please do not hesitate to give us a ring at (08) 8344 7298 and allow us to design the best system to suit your needs.