Queensland Farmers' Federation

Battery Factsheet

Well-designed solar systems used in conjunction with batteries will store solar generation during the day for use with night-time loads. Further solar generation is then used for daytime loads with any remaining exported to the grid.

Common battery types supplied in nominal voltages 12,24 and 48 volt

Lithium (Li)	Light weight with higher upfront costs though lower $/kWh in the long term. Higher charging rates can sustain a low state of charge over a long period of time. Can shut down at low and high temps and continuous high loads.
Lead Acid (PB)	Lower upfront cost and long-life expectancy if maintained correctly. Batteries are heavy, low depth of discharge.
Zinc Bromide (ZnBr)	Flow technology. Up to 100% depth of discharge rates can handle tough high load minimal maintenance situations though slower charge times.
Nickel Iron (NiFe)	Very long life. 100% DOD. Higher cost over lead acid. Self-discharging, slow to charge and discharge requiring higher kWh capacity to meet onsite demand. Expensive and require some maintenance.

Inverter choice

Battery systems generally require the use of a DC to AC inverter. Two highly recommended inverters are Victron and Selectronic. A good inverter will enable parameters and priorities to be programmed where a compromise in battery life and site application is considered. Installers should configure these settings once installed.

The inverter sizing requires compatibility with the battery voltage e.g. 12/24/48v and battery type. The inverter sets the charge rating for the batteries as the system requires balance for batteries to reach full charge. During the design process installers should consider a temperature de-rating of 1.2, the continuous power demanded by the site in kW and any surge or peak power. This may include a specific time period, say 10kw@60secs.

The **ratio** of an AC/DC coupled inverter considers the maximum size a solar inverter can be. A 1:1 indicates a 5kw solar to 5kw battery while 1:2 will allow double the solar inverter capacity, an important consideration for future expansion though don't oversize. Ensure your inverter has pass-through capability for generator connection if required.

Battery Terminology

Depth of Discharge (DOD)	Measured as a percentage of total kWh used to total available capacity. DOD will determine the amount of life cycles a battery system will provide under general operating conditions. A general safe range for lead acid is around 50%, Lithium 80% and with some flow types 100%.
Total available capacity	Of the installed battery system in kWh. Useable power will be defined by the set depth of discharge (DOD) for the battery type. An example of total available capacity is a 10kW battery system with 5kW available at 50% DOD. This information is crucial for designing a system that will meet your site needs.
State of Charge (SOC)	Total kWh available. When no load is applied *open circuit voltage* applies and can be measured across the battery terminals.
Battery cut off voltage	Will limit further export and requires *constant current charge*, usually to around 70% SOC until reaching 100% SOC. A *float voltage* is maintained by a constant voltage charge, keeping the batteries topped up ready to go
Maximum Continuous Discharge	Dictated by the battery specifications. The amount of current that can be drawn from a battery is limited, to avoid damage.
Terminal voltage	When load is applied across the battery terminals, this varies according to SOC and discharge.

This fact sheet was developed in 2021 as part of The Energy Savers Plus Program Extension, funded by the Queensland Department of Energy and Public Works.

QFF Queensland Government