Battery Care Guide

Storage batteries are the heart of all stand alone wind/PV or inverter electrical systems. Their function is to balance the outgoing electrical requirements with the incoming power supply. They offer a reliable source of electricity which can be used when solar or wind power is not available. Batteries are able to provide short term power output many times higher than the charging source output. In diesel generator systems they allow power to be available 24hrs/day but mean that the generator need only run for short periods to charge the battery.

Lead Acid Batteries are the most common type of energy storage. All lead acid batteries are based on the same lead/sulphuric acid chemical reaction, however, they have evolved into different types ï each designed for a specific need.
Smaller batteries look like big car batteries and contain several cells in tough plastic cases to give 6V or 12V with capacities up to ~ 200Ah. They are either flooded cell types: with a vent for gassing and topping-up with distilled water; or sealed/gel types: with an immobilised electrolyte.
Larger battery banks are usually made up of flooded 2V cells ranging in capacity of ~100Ah to several thousand. Sealed types are also available. Some flooded cell batteries using tubular positive plates instead of flat plates have longer life.

Battery capacity is how much electrical energy the battery can deliver and is measured in ampere hours (Ah) when uniformly discharged over a given period of time. Eg. A 120Ah @ 100hr rate battery will be fully discharged in 100 hours by a 1.2 A current. If discharged at a higher rate (by a higher current) then battery capacity is reduced considerably. Max. charge/discharge current should be less than 10% of battery Ah capacity.
Lower temperatures significantly reduce battery capacity (figures are at 25°C). The older a battery becomes, the lower will be the capacity that can be obtained from it.
The capacity of the battery bank needed depends upon amount of storage required; types of charging source; maximum charge & discharge rates; and temperature of operation. The one requiring largest capacity will dictate battery size.

Battery life is measured in number of discharge/charge cycles rather than years. The more deeply the battery is discharged the lower the number of cycles it will last for. The percentage depth of discharge (DOD) of a battery means how much of the available power in the battery is used before recharge. Although deep cycle batteries can be discharged by 80% of their rated capacity (80% DOD); designing for less than 50% gives much longer battery life.

Overcharging a battery raises the temperature of the electrolyte, causing excessive gassing, loss of distilled water and eventually damage to the plates. Consequently use of suitable charge controllers and well regulated battery chargers are necessary with any battery charging system to limit charging current as the battery voltage rises.

Excessive discharge of a battery can also lead to permanent damage. If a battery is close to itôs fully discharged state it should be recharged immediately (e.g. by using a generator and charger) or if that is not possible all loads switched off until the battery can be charged. In order to monitor this a system voltmeter is recommended and low voltage alarms and load disconnection devices are available.
Batteries need to be regularly boost charged and allowed to ógasô freely for an hour or so. This equalises individual cell voltages within the battery and helps avoid electrolyte stratification.

No battery is 100% efficient. Energy is lost in storage, charging and discharging. With new cells efficiencies of ~ 90% can be expected, however this decreases with age, sulphation and stratification. To maximise efficiency, batteries should be kept at room temperature, and sized correctly for their purpose, both to minimise self-discharge, and to prevent them being charged and discharged too rapidly. Sulphation is caused by a battery being left in a discharged state for a long period. Stratification is caused by low cycling allowing the battery electrolyte to settle into layers of different densities. It can prevented by regular equalization charges.

The battery bank should be installed, preferably on itôs own, in a weather & frost protected, well ventilated shed or other enclosed area. Ideal temperature is ~ 20°C & should not be more than 43°. For optimum performance, batteries should all be the same brand, age and amp-hour capacity within a battery bank. Proper battery connections should be used, designed for high currents and long life. Connections should be tight and covered with petroleum jelly to prevent corrosion. Batteries and connections should be checked from time to time for cleanliness and integrity.
Electrolyte levels must be checked periodically and kept topped-up using distilled or de-ionised water as necessary. Batteries produce explosive hydrogen gases during charging, so avoid sparks or flames. They contain corrosive chemicals. Utmost care must be taken whilst working with batteries.