SOLAR UK

Optimum sizing of Battery Storage solutions for excess PV production

Battery system Power and Capacity

A battery storage system has two critical sizing parameters, one is the power of the system. This is the amount of power the system can charge and discharge at measured in KW or AMPS , for example a PowerVault system utilises a standard 13 Amp plug connection so is limited to 2 KWP. So if the household is drawing 3KW of power (300 Watts of parasitic power for TV, fridge, Router etc and someone turns on a 2.7KW kettle) then the powervault can only supply 2KW even if the batteries are fully charged so the additional KW needs to come from another source (PV if available or paid for from the grid!) However a 3KWP Battery system would still be able to provide ALL the energy thus saving the expense of the grid top up!
The same principal applies for charging the batteries, if the household has a 3 KW PV system and a 2KW battery power package then during full sunshine the battery can only charge at the 2KW rate so potentially 1 KW of Solar Energy is lost to the grid where as the 3KW battery solution would still save ALL the PV energy for use in the household.

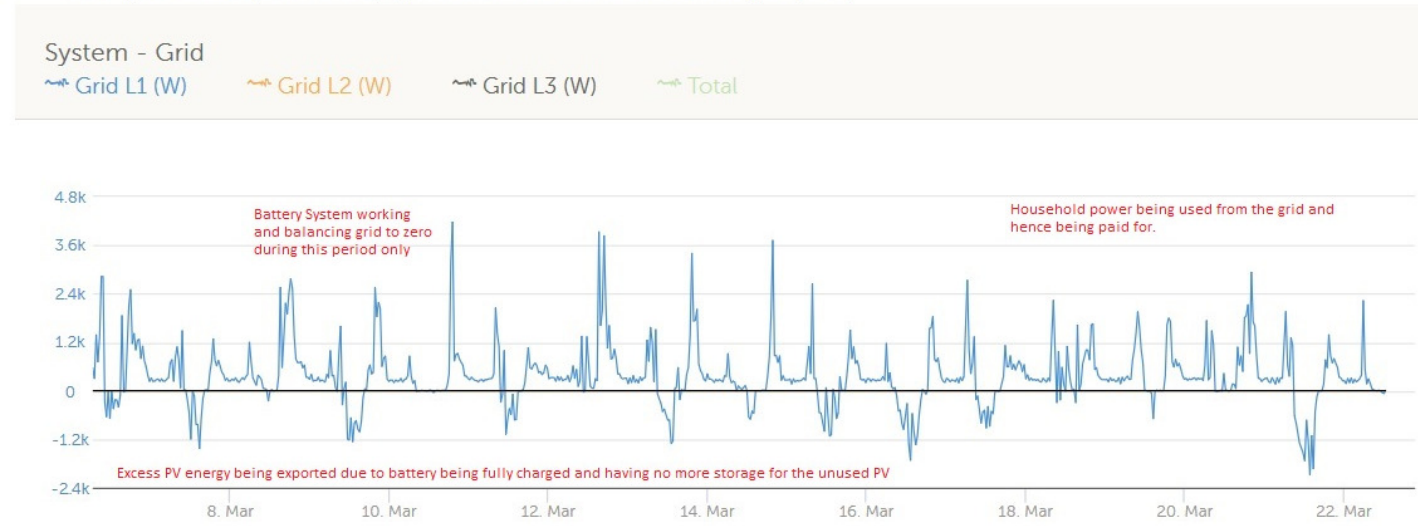
The second critical parameter is the battery storage capacity, this is a measure of the amount of energy that can be stored in KWhours or AmpHours. This value can be difficult to compare as different battery technologies and different manufacturers use different specification measurements! The charge and discharge rate , temperature and battery type all affect the absolute capacity and the usable capacity is always less as fully discharging (flattening!) a battery does significant damage and the lower the discharge on each charge discharge cycle reduces the battery life. This also affects the warranty periods and the life of a battery is nominally determined as when the available capacity has reached 50% of the original usable capacity! Tesla Power Wall claim you can use 100% of their battery capacity (although what they actually do is put 7.7 KWH of lithium batteries in and call it 6.4KWH as lithium batteries work best with a maximum 80% discharge and Tesla sell the 100% usable capacity!) Deep discharge lead acid batteries normally recommend using a 50% discharge limit to give a long service life. We would recommend a minimum of 4KWH for a small household and 6 to 7 KWH for a larger household.

Battery Storage Principle Operation

The current flow to and from the Grid is monitored by the Amp meter.
If there is PV power being generated over and above what the household is consuming the excess would normally flow back onto the grid, however the Amp meter detects this and instructs the Battery inverter to charge the battery bank.
Should the Amp meter detect current flowing in from the grid it will instruct the Battery Inverter to discharge the batteries.
If the household load exceeds what the PV and Batteries can supply, power will be drawn off the grid in the normal manner, likewise if the batteries are fully charged excess PV will go back on to the grid.
In the event of Grid failure SOME Battery Inverters will isolate the non-priority load but use the batteries to
keep the priority loads (UPS) “live”, so any household load on the protected supply will continue as long as there is Battery power which also can still be topped up from the PV. This will give you an advantage of using your PV system to generate power during a power cut and also power critical loads i.e. freezer, heating controls.

Battery system output power and Battery storage capacity optimised

Example of Inadequate Battery system Power and insufficient storage capacity



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