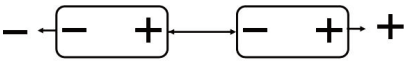
Batteries

Batteries are the heart of any off-grid power system providing storage for energy when it is not required.

They MUST be cared for, maintained and understood. 2 Volt cells make up the required voltage. Leisure and car batteries come in 6 cells to make 12 Volts and most domestic systems are a multiple of 12V (e.g. 24V, 48V). The higher the voltage the thinner cable can be used and the more efficient for inverting to 240V.

Wiring batteries

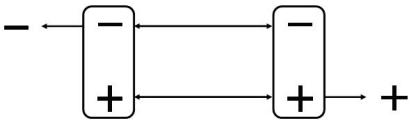
(Example using 12Volt, 100Ah batteries)



SERIES: 100Ah @ 24V

Series

- Volts adds up
- Amps stay constant



PARALLEL: 200Ah @ 12V

Parallel

- Volts stays constant
- Amps add up

Battery state of charge (SOC)

The easiest way to determine state of charge is to measure voltage with a multi-meter (Vdc), do this when it has been at rest for 3 hours. Specific gravity is the ratio between the de-ionised water and acid, it is measured with a hydrometer.

Percentage of charge	Cell Voltage	Battery voltage			Specific gravity
		12 V	24 V	48 V	
100%	2.12	12.7	25.4	50.9	1.265
90%	2.10	12.6	25.2	50.4	1.249
80%	2.08	12.5	25.0	49.9	1.233
70%	2.05	12.3	24.6	49.2	1.218
60%	2.03	12.2	24.4	48.7	1.2
50%	2.02	12.1	24.2	48.5	1.19
40%	2.00	12.0	24.0	48.0	1.176
30%	1.97	11.8	23.6	47.3	1.162
20%	1.95	11.7	23.4	46.8	1.148
10%	1.93	11.6	23.2	46.3	1.134
0%	<1.93	<11.6	<23.2	<46.3	1.12

Sizing your battery bank

The following calculation goes through step by step your energy needs for an off-grid system. The result is amp hours/day required as batteries are rated in Amp hours (Ah). A domestic system should allow for 3 days with no input, multiply (h) by 3 to get the ideal battery bank size. Of course cost and availability are always an issue...

Calculate all AC loads

Appliance Watts	x	Hr/wk	=	Wh/wk
	x		=	
	x		=	
	x		=	
		Total		(a)

Multiply by 1.1 to allow for inverter losses

(b)

Calculate all DC loads

Appliance Watts	x	Hr/wk	=	Wh/wk
	x		=	
	x		=	
	x		=	
		Total		(c)

Add (b) and (c) to give total DC Watt hours per week required

(d)

Battery voltage (e)

Divide (d) by (e) to get total amp hours required per week by all loads

(f)

Divide by 7 to get average amp hours required per day

(g)

Multiply by 1.2 to allow for losses

(h)

This is the average amount of amp hours that you need to be stored to last a day with no input

Batteries can be stored outside but should be protected from frost and hot sunshine. It is advised to build an insulated but vented box whether inside or out as when they charge they produce hydrogen gas. You can contact us to source reliable and cheap second hand forklift traction batteries and for further advice.

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