

Sizing Battery Bank

Step 1 Determine required battery-bank output to meet the load (in Ah)

$$B_{\text{output}} = \frac{E_{\text{crit}} * t_a}{V_{\text{sdc}}} = \frac{1080 \frac{\text{wh}}{\text{day}} * 1}{12V} = 90 \text{ Ah}$$

Step 2 Calculate the rated battery bank capacity taking into account depth of discharge (DOD) and derating factor.

$$B_{\text{rated}} = \frac{B_{\text{output}}}{DOD * C_{t,rd}} = \frac{90 \text{ Ah}}{0.5 * .8} = 225 \text{ Ah}$$

Step 3 Select battery with given voltage (V_{batt}) and rated capacity (B_{batt}). For this project I have chosen to use the 6v batteries that we already have. They are 6v and 225 Ah.

Step 4 Calculate number of batteries in series needed to match the required capacity.

$$N_{\text{batt,series}} = \frac{V_{\text{dc}}}{V_{\text{battery}}} = \frac{12V}{6V} = 2 \text{ batteries in series.}$$

Step 5 Calculate number of battery strings needed in parallel to match the required capacity.

$$N_{\text{batt,parallel}} = \frac{B_{\text{rated}}}{B_{\text{batt}}} = \frac{225 \text{ Ah}}{220 \text{ Ah}} = 1 \text{ batteries in parallel.}$$