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Battery Bank Worksheet

How to fill out this worksheet Table A1:

1. Get your daily **Power Consumption** from the Power Consumption Worksheet and enter in **Column A**
2. Using Table V1, determine and enter your **Battery Voltage** in column **B.**
3. Divide the value in **Column A by Column B** and enter the **Daily Amp hours** in **column C.**
4. Multiply the **Column C times 1.2** to account for system inefficiencies and derating factor and enter the value in **Column D**.
5. Enter **number of days** you require stored power (usually 5 to 8) in **Column E**.
6. Multiply **column D times column E** and enter the result in column **F**.
7. Enter battery depth of discharge (0.5 to 0.8) in Column **G** - (How deep you want the battery to discharge – 50% to 80%)
8. **Divide Column F by Column G** and enter the result in Column **H**
9. Determine the average coldest temperature to which the battery will be subjected and select the temperature reduction factor from the table T1. Enter the **Temperature factor** in Column **I**
10. Multiply Column H times Column I and enter the value in Column J which is the required Battery Amp hours for your system
11. Select a battery bank from the SBE-Battery Brochure using the Battery Amp Hour calculated in Table A1and the Battery Voltage Required (Table V1).

Table A1: Battery Amp Hours

A	B	C	D	E	F	G	H	I	J
Power Consumption from Worksheet	**Table V1: Battery Voltage**	**A ÷ B**	**C × 1.2**	**# of Days Storage**	**D × E**	**Battery Discharge (0.5 to 0.8)**	**F ÷ G**	**Table T1 Temperature Factor**	**I × H Battery Amp hours**

Table V1 – Battery Voltage (Contact SBE for other PV)

PV Kit	Minimum Voltage
SBE-PV80	**12**
SBE-PV260	**12**
SBE-PV705	**24**
SBE-PV1410	**24**

Table T1: Temperature Reduction Factor for Average Lowest Temperature of Battery

Temp	Factor		Temp	Factor		Temp	Factor
80 F	**1.00**		**40 F**	**1.18**		**0F**	**1.42**
70 F	**1.04**		**30 F**	**1.22**		**-10F**	**1.48**
60 F	**1.08**		**20F**	**1.28**		**-20F**	**1.55**
50 F	**1.12**		**10F**	**1.33**		**-30 F**	**1.63**

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Battery Sizing Points:

- Connecting batteries in series, positive to negative adds the voltages and does not change the Amp-Hours
- Connecting batteries in parallel, all negatives together and all positives together, adds the Amp-Hours but does not change the voltage.
- A battery bank may have batteries in series strings with those connected in parallel to increase capacity.
- A battery bank with the fewest number of cells (or batteries) is preferred to one with many batteries in parallel connection.
- The maximum power voltage (Vmp) of the PV panel should be about 1.5 times that of the voltage of the battery / battery bank.
- That is, a 12 volt battery should have panels with a Vmp of around 18 volts; a 24 volt battery should have a panel Vmp of about 36 volts.
- Some charge controllers can accept much higher voltage inputs and step the output down to the required battery voltage.
- That can allow panels to be connected in series which can save on costs of wire over long runs.
- To build your bank, try first to select a deep cycle battery that is rated close to the Ah capacity you calculated. Ignore voltage for a moment. If you can't find one that's very close, look for one that has a capacity either one-half or one-third your needed Ah. These fractions represent the number of series strings of such batteries you would need, in parallel, to complete your bank (1/2 = 2 strings, 1/3 = 3 strings). Once you find a candidate battery, divide your system voltage by the battery's voltage. This will give you the number of such batteries you would need in each series string.
- The total number of individual batteries you will need to complete your battery bank will be the product of the number of strings needed to meet your Ah requirement and the number of batteries per string needed to meet your system voltage requirement.
- Total # batteries in bank = (# series strings) X (# batteries per string)

Sketch Pad