

# **How to Keep Batteries Alive for Years and Years**

(Credit for much of this list goes to Windy Dankoff of Dankoff Solar Products, Inc. 2003. I added several items. Jack)

Note: Don't let the length of this list scare you. I spend about one minute a day on my batteries. About every six months I do a thorough check of the battery bank. It's easy!

Though most consider lead-acid batteries the weak link in renewable energy systems, today's renewable energy batteries are better than ever, and so are the devices that regulate and protect them. Battery failures are rarely the fault of the batteries themselves! Follow these guidelines to avoid the vast majority of all battery problems.

1. Size the battery bank and PV array properly. The battery bank should have a five day load capacity at a minimum. The PV array, should produce (on average) 30% more energy than the load requires. (This is a best case scenario. You may not be able to afford such a perfect system. Jack)
2. Buy high-quality batteries selected for your needs. You get what you pay for! Good deep-cycle batteries can be expected to last for 5 to 15 years, and sometimes more. Cheap batteries can give you trouble in half that time.
3. Connect the two main cables to opposite corners of the battery bank and maintain symmetry in wire size and lengths. This will help to distribute current evenly through the bank.
4. Arrange batteries to maintain even temperature distribution throughout the bank. Avoid uneven exposure to heat sources. Leave at least ½-inch of air space around each battery to promote even cooling.
5. Prevent corrosion. Once corrosion gets hold, it is hard to stop. The good news—it is easy to prevent! Apply a non-hardening sealant to all of the metal parts of the terminals BEFORE ASSEMBLY. A product called NO-CO NCP2 battery corrosive preventative works well. Vaseline or bearing grease will also work.
6. Moderate the temperature. Batteries lose approximately 25% of their capacity at 30 degrees Fahrenheit, compared to a baseline of 77 degrees Fahrenheit. At higher temperatures they deteriorate faster.

7. Install the batteries over a floor drain, or in a space without a floor, so that they can be rinsed with water easily. Washing the battery tops about twice a year will remove accumulated moisture (acid spatter) and dust. (I couldn't put my batteries in an area with a drain. I wash them off with a damp paper towel.)
8. Avoid multiple parallel strings.
9. Use a charge controller, power center or battery charger with temperature compensation. Better yet, place the batteries in a room that is temperature regulated, i.e. heated, insulated, shaded and ventilated.
10. Use an inverter or charge controller with a low-voltage disconnect or get a separate one. Discharging a battery to exhaustion will cause immediate, irreversible loss of capacity and life expectancy.
11. Equalize lead acid batteries once a month. Equalizing means bringing the batteries to a boil at about 15.5 volts for a few hours. This helps remove sulphate from the battery cells. Some charge controllers automatically equalize the battery bank, Other controllers have an equalization switch. Sealed batteries are not equalized.
12. Install a System Monitor, at least a digital voltmeter. Would you drive a car with no dashboard? Metering is not just bells and whistles. I use a BCM-12 LED meter (\$42).
13. Add distilled water as needed. Most batteries require additional water every 6 to 12 months.
14. Avoid sealed marine batteries in solar applications. They can disintegrate and/or explode. ("Solar Power 101 : Batteries", Backwoods Home Magazine, May/June 2004)
16. Do not replace one battery at a time. Remove bad batteries and have a smaller battery bank until the entire bank can be replaced.
17. Get a hydrometer. It costs about \$10. An hydrometer allows you to test each cell in your batteries. If a battery has bad cells it should be removed from the battery bank.
18. Put one teaspoon of Epson salts in each cell of new lead acid batteries.

19. This is the most important aspect of battery care! Check the voltage of the battery bank daily. The best time to check the battery bank is early in the morning before the sun hits the panels and before any energy is used. Your goal is not to go below 80% of full charge, or 12.46 volts. The batteries will last much longer if only the top 20% is used.

| <b>% of Charge</b> | <b>Voltage</b> | <b>Specific Gravity</b> |
|--------------------|----------------|-------------------------|
| 100                | 12.70          | 1.265                   |
| 90                 | 12.58          | 1.249                   |
| <b>80</b>          | <b>12.46</b>   | <b>1.233</b>            |
| 70                 | 12.36          | 1.218                   |
| 60                 | 12.28          | 1.204                   |
| 50                 | 12.20          | 1.190                   |
| 40                 | 12.12          | 1.176                   |
| 30                 | 12.04          | 1.162                   |
| 20                 | 11.98          | 1.148                   |
| 10                 | 11.94          | 1.134                   |
| 0                  | 11.90          | 1.120                   |

These readings are correct at 75° Fahrenheit.  
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Batteries are the heart of your power system. They may demand your attention occasionally, but your relationship with them need not be a struggle. With proper installation, a little understanding, and some simple maintenance, your batteries will live long and healthy lives.