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| Storage Batteries : the fuel tank of your solar power system |
| Without batteries to store energy you would only have power when the sun was shining or the generator was running. This tutorial describes the 4 basic types of batteries & provides some good tips on the care & feeding of your batteries to maximize their performance and life. |
| Batteries for alternative energy systems are available in 2, 4, 6, and 12 volts |  |
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| 1) RV / Marine / Golf Cart RV or Marine type deep cycle batteries are basically for boats & campers and are suitable for only very small systems. They can be used but do not really have the capacity for continuous service with many charge/discharge cycles for many years. Regular or Car type batteries should not be used at all because they cannot be discharged very much without internal damage. A very popular battery for small systems is the Golf Cart battery. They are somewhat more expensive than deep cycle recreational batteries but are probably the least expensive choice for a small system on a budget. |
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| **Industrial strength : Flooded, Gel, and AGM sealed batteries** |
| The next 3 types are the heavier industrial type batteries. They are all also considered Deep Cycle and are usually Lead Acid types with much thicker internal plates that can withstand many deep discharge cycles. These next 3 are all designed for alternative energy systems. |
| 2) Flooded types These are Lead acid batteries that have caps to add water. Many manufacturers make these types for Solar Energy use. Trojan, Surrette, and Deka are probably the most well-known. They are reasonably priced and work well for many years. All flooded batteries release gas when charged and should not be used indoors. If installed in an enclosure, a venting system should be used to vent out the gases which can be explosive. |
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| 3) Gel  Not to be confused with maintenance free batteries, sealed gel batteries have no vents and will not release gas during the charging process like flooded batteries do. Venting is therefore not required and they can be used indoors. This is a big advantage because it allows the batteries to maintain a more constant temperature and perform better. |
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| 4) AGM  Absorbed Glass Mat batteries are in my opinion the best available for Solar Power use. A woven glass mat is used between the plates to hold the electrolyte. They are leak/spill proof, do not out gas when charging, and have superior performance. They have all the advantages of the sealed gel types and are higher quality, maintain voltage better, self-discharge slower, and last longer. The Sun Xtender series by Concorde Battery is an excellent example of AGM batteries. They are more expensive, but you usually get what you pay for. You will find this type of battery used in airplanes, hospitals, and remote telephone/cell tower installations. |
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| **Care and Feeding** |
| It's important to take good care of your batteries. | I would say that if you are not comfortable, then neither is your equipment. I was mostly referring to temperature and humidity. In fact battery capacity ratings are usually specified at 77F or 25C. As batteries get colder their voltage drops and performance suffers. This is one major reason I prefer AGM batteries because they can be stored indoors where the temperatures vary less. |

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| Another important thing to consider is how deeply you discharge your batteries. This is known as the DOD (depth of discharge). In other words, how low you let the voltage drop before the next charge cycle. Most battery ratings talk about 50% or so, but they will last longer if you keep them as charged as possible. I like the 70% range. Lead acid batteries like to be fully charged. They will last much longer if you do not discharge them too deeply. This is known as shallow cycling and greatly extends their life. However, they can withstand discharges down to 20% or so, but I wouldn't do it too often**How to determine how charged your batteries are**Determining the percentage of battery charge from meter readings can be monitored via your charge controller. Alternatively, a common voltmeter and this voltage chart will give you a good idea of the SOC (state of charge) of your batteries.**Wiring diagrams for multiple batteries** The battery Wiring document covers the various configurations for wiring multiple batteries together to obtain increased current capacity (power) and also different voltage configurations.Overall, a good economical choice for a small to medium size system would probably be the Trojan L-16 flooded type batteries. I still recommend AGM if you can afford the up-front investment. For good quality batteries, you will end up paying about $115 to $160 for every 100 AmpHours of battery capacity at 12 volts |