



### **The Case for Energy Storage in Renewable Energy Systems:**

Starting with the discovery of electricity over 300 years ago, electrical energy was always coupled with energy storage. Original battery storage systems were crude jars with exotic chemicals combined with metals or other materials. It has only been since Nikola Tesla's inventions concerning AC power in the early 1900's that power generation has been in "real time" with power usage. AC power, which can be transmitted over long distances (with some difficulty and large losses) has become with basis of our national grid, as in Europe and Asia, owing mainly to our rebuilding efforts there after WWII. As Tesla himself said, there are limits to the capabilities of AC power and we have reached those limits. Since nearly all AC power generation has some negative environmental effect, it is time to reconsider storing energy for later use and no longer relying on all real time supplies. REAL TIME may work well with the internet, but not with megawatts of electrical energy. Consider that all other systems we use as the basis for modern life rely on energy storage. Oil and gas are captured and stored. Telephone systems use batteries and public utilities store water for continued use. All locomotives utilize DC power for motors. Utility power plants all have enormous battery storage banks to keep the plant operating as do all telecommunications companies. Nearly all renewable energy hot water systems rely on storing heated water for later use-this is energy storage. Nearly everything we do REQUIRES energy to be stored EXCEPT the AC power that comes to your home or business.

**Efficiency:** Many will claim that PV (solar electric) module output is more efficient without batteries, and that the higher voltage grid tie inverter systems are more effective. Nothing could be further from the truth. All PV modules are affected by temperature; higher temperatures degrade output and lower ambient temperatures increase output. Further, the voltage of the system is solely based on the requirements of the inverter (the device that changes DC to AC) rather than a specific scientific equation. It is interesting to note that the whole battery controversy grew out of an effort to sell more PV panels on the part of the PV manufacturers rather than some specific fact relating to system efficiency. The manufacturers of PV simply wanted to sell more modules to make more money-PV panels are 90% of the cost of any non-battery system.

**The Bottom Line:** Highly efficient and very long life AGM batteries are available and increase the efficiency and effectiveness of any renewable energy system. They allow the system to increase or maintain a production level equivalent to the same effect of having almost twice the solar (PV) panel equivalent in wattage while maintaining a lower profile in installing the panels (you don't have to cover an entire roof with panels) and given the normal tax incentives and rebates, you will come out ahead while spending the same overall dollar amount. A 2kw grid-tied PV system with batteries will provide the same overall reduction in actual billing as a 4kw grid-tied PV system without batteries and the two systems will cost about the same to purchase and install. The difference is that the 4kw non-battery system will not give you ANY backup power, will be off-line more, and will not reduce your electrical load to the utility unless the sun is shining. Further, if any of the utility rebates or credits were to be diminished, your investment in the grid tied system without batteries would be useless. A grid tied system without batteries operates at a hefty 250-500vdc, so you won't be doing a homeowner modification to get power from them if needed. Given all the factors of climate change, drought, extreme weather-energy storage simply makes sense.