How to Use Renewable Energy

By now, it's safe to say that most people understand the importance of renewable energy. With pollution and greenhouse gas emissions higher than ever, renewable energy is often considered the eco-friendly solution to the world's power needs. What is less well known, however, is how to use renewable energy effectively. Supporting electronics, electrical components and subsystems are required to use most types of renewable energy, especially for renewable energy technologies that produce electricity.

Cold Fusion. Earlier blogs have noted that industry has its sights on how to design and build cold fusion systems that can produce energy output that is greater than what is available with other renewables. New Energy Power System's design of its Mk12.31 system is an example described through some of the blogs on this website. Supporting electronics are depicted in the following subsystem schematic.

Electronic Control Subsystem

The system cannot operate without this or some similarly complex electronic subsystem. In the diagram, CAN and UPS are abbreviations for "controller area network" and "uninterruptable power supply". Note on the right side of the diagram that the electronic control subsystem is required to process temperature, pressure, acoustic, electric current and nuclear radiation data from a number of connected instruments. The computers/controllers use these data to determine operational steps for pulsing the gas valves, and for providing high voltage on the

anode and electric current to the anode heater and microwave “initiator”, for example. Major functions are to control the addition of extremely small increments of high pressure hydrogen and deuterium gas into the reaction vessel, to facilitate diffusion of hydrogen and deuterium through the cathode, and to manage temperature within the cathode. Additional details on design and operation of the electronic control subsystem can be found in patent application US 2018/0087165A1.

Other types of renewable energy, such as solar power, wind energy, and geothermal energy, also require supporting electronics, electrical components or subsystems for their use, as the electrical output of the prime energy source is not usually in a form that can be used directly in the consumer's equipment. Main categories of components/subsystems are:

(a) Energy Storage. High capacity storage batteries [click on https://www.engineering.com/ElectronicsDesign/ElectronicsDesignArticles/ArticleID/16489/Batteries-and-Inverters-in-Solar-Energy.aspx] are needed in stand-alone power generating systems to maintain operation during periods when energy demand exceeds the supply, for example during weather outage when less energy is produced by solar panels. Batteries are also needed to help create a clean, regulated, alternating current power output for customer use and as a buffer to match variations in available energy and customer energy requirements.

(b) Power conditioning electronics [click on https://www.testandmeasurementtips.com/7120/] are needed provide a pure, noise-free sine wave output at a standard, fixed frequency and voltage to the user, and also to replicate the frequency and voltage from any connection to the long-distance grid. An inverter is required to convert direct current (DC) from batteries to alternating current (AC) power at a standard supply voltage and frequency, and deliver the AC power to the user's electrical equipment. “Synchronous” inverters take their frequency and voltage references from the grid. “Grid-tie” inverters convert direct current into an alternating current suitable for injecting into an electrical power grid, normally 120 V RMS at 60 Hz or 240 V RMS at 50 Hz. Since the battery voltage is usually quite low, the inverter incorporates a DC-to-DC converter that is able to transform the low voltage DC from the battery to a higher voltage DC for the inverter circuit. The inverter also usually has its own voltage regulator to ensure a stable AC voltage level is provided.
(c) Fuses, circuit breakers and surge suppressors are needed for safe operation, to protect both the users and the equipment.

Tesla Motors, Inc [click on https://www.tesla.com/energy] manufactures a Powerwall to support individual homeowners and a Powerpack to support industrial applications. Each Powerpack contains 16 individual battery pods with isolated DC-DC converters, and a thermal control system that monitors cell level performance. Its inverters are bi-directional, converting AC grid power to DC for Powerpack storage, then converting this DC power back to AC for grid interconnection.