

## **Security of Supply for Micro-renewable & Sustainable Power Generation Schemes.**

Currently, one of the most popular methods of implementing off-grid, sustainable power generation is the installation of a micro generation system comprising wind turbines and photovoltaic cells. This provides power directly to the consumer; however, the unpredictable and fluctuating nature of the energy sources makes for problematic use and provides no security of supply. This lack of continuous reliable power from such micro generation schemes limits their use to niche applications such as remote dwellings, roadside traffic signage and bus shelter illumination. However, if a solution can be found to the security of supply issue then there are other potentially more technically challenging applications that may be addressed. For example, remote, off-grid wireless telecommunication cellular stations.

For reasons of cost and technical issues related to on-grid application of wind turbines, most micro generation schemes in use today are connected directly to the grid. However, on-grid micro generation systems provide no security of supply during a grid outage as the generators, photovoltaic cells and wind turbines need to be disconnected for safety reasons. Security of supply can be increased by adding an energy storage device, such as a battery, however this will always add cost to the system.

### **Adding Energy Storage using Lead Acid batteries**

The most widely used battery in the renewable micro generation market at the moment is the Lead Acid battery. These batteries, whilst being low cost and widely available, generally require a low charge rate and can not tolerate widely fluctuating charge currents. Photovoltaic cells are generally Lead Acid battery friendly in that they produce a relatively constant output charge current. On the other hand wind turbines can significantly reduce battery life due to natural 'gusty' wind conditions causing the generation of highly fluctuating charge currents. Lead acid batteries therefore are very suitable for use with photovoltaic micro generators however premature ageing results when used with wind turbines. This acts as a deterrent to implementation in off grid applications as frequent, expensive battery replacements are often required.

### **Adding Energy Storage using Lithium Cells**

Lithium cell technology is able to tolerate significantly higher charge rates making it far more suitable for use in wind turbine, off grid battery applications. Despite being a higher cost battery technology it would require replacement far less frequently than lead acid and as such potentially offers a lower cost battery solution over the life of the micro generator.

Increased security of supply for both off grid and on grid micro generation schemes can be realised by implementing suitable lithium based battery technology with the added advantage of lower overall cost when compared to an existing lead acid system.

In addition to advances in battery chemistry technology, appropriate battery management systems offer further potential for improvements to security of supply. Accurate State of Charge and State of Health determination coupled with a remote communication capability enables predictable preventative maintenance for both remotely and locally deployed systems.

In summary, improvements in security of supply are required to drive the further adoption of both off grid and on grid sustainable micro generations schemes. It is proposed that the combination of lithium cell technology and advanced battery management systems offer a level of supply security that far exceeds the incumbent lead acid systems.

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