



POWER CONTROL ENGINEERS

Power System Quality using Large Scale Energy Storage White Paper

Power System Quality Using Large Scale Energy Storage

The origins of battery storage systems were typically to provide reliable power to remote sites, whilst the focus of converter and battery technology was primarily residential / smaller scale installations. Improvements in converter control system technology has resulted in systems having greater functionality, and new applications providing improved power system quality for larger scales.

Currently utilities are looking at utilising this technology to reduce peak loads on sections of a network. There are several other applications to improve power system quality. The following are examples:

1. Power Factor or VAR support

Power converters can now provide the same functionality as a Statvar and can inject current to match a power factor set by the operator. The converter technology provides this functionality without the requirements for batteries.

2. Voltage flicker

The system can respond quickly to changes in voltage and inject Vars (current out of phase) to boost system voltage. An example is Var support for starting of large DOL motors. The long-term damage of equipment connected to an unstable voltage source could be considered as a commercial motivator for this application.

3. Spinning reserve

Large scale energy storage systems can provide shorter term grid support which removes or reduces the requirement for spinning reserve. The converters can very rapidly inject real power on detection of a system overload and therefore the spinning reserve requirements. The reduction in maintenance of large generators can be a commercial driver to use this technology.

4. Frequency control

The converter can be set to maintain a system frequency and inject real power in under frequency events and absorb power in over frequency as necessary.

5. Supply security

Converter technology can sync with the system supply and maintain the supply in the event of a supply failure. The converter can re-sync on supply recovery. This can be done seamlessly with no noticeable loss of power to the load.

6. Combination

Several converters can be combined to provide the above functionality and more. Alternatively individual converters can have the control philosophy changed on the fly to suit requirements.

The costs of equipment damage and other issues caused by poor power quality provide opportunities for deployment of the above technology. Several manufacturers now provide converters with a range of applications and functionality.

The adoption of this technology into heavy or major industry is still in its infancy. PCE has been involved with the design of several systems for utility applications and for private industry.

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