Energy Storage

Submission to the Australian Government Productivity Commission – Energy Efficiency

Introduction

I wish to provide a point of reference to the Commission, namely, '*Energy Storage'*.

I am prompted by the apparent absence of any advocacy to the Commission on this topic to date and very little acknowledgement or debate by Australian industry and state governments over the past several years.

My understanding is, that for electricity energy to be efficiently supplied, it must be capable of being provided at a near constant level. Sudden increases in demand or voltage irregularities in the transmission and distribution phases, need adjustments, such as a stand-by (spinning) reserve to convert to a reliable flow. Without a reliable supply, industry, commerce and the community face uncertainty and risk.

Globally, energy efficiency has unfortunately been a victim of a conservative energy industries and governments who continue to rely on depreciating infrastructures and lower costs of production, based on the burning of fossil fuels. Marginal commercial solutions involving the use of new technologies for gaining efficiencies are therefore not considered a priority by electricity generators unless financial incentives are available.

When one considers the increasing global demand for energy as well as the demands placed on existing large and fragile grid systems, one needs to consider better and more efficient ways of generating, transmitting and distributing electricity than is generally available.

If there are emerging global trends likely to influence change in this area, they are likely to be due to 'climate change', 'renewable energy' alternatives and the recognition that there is no one-solution such as large grid systems.

However, let us also not forget the contribution of enabling technologies such as advanced storage systems.

Energy Storage Systems

Energy storage technologies such as advanced batteries currently provide load-levelling, peak shaving and UPS (uninterrupted power supply) services. As well as functioning in remote (off-grid) areas, these batteries can also work (on-grid) as part of a distributed energy system (closer to the end-user) and therefore less prone to the disruption affecting a main grid.

Energy storage systems also have the potential in renewable energy (wind or solar) applications to solve the *'missing link'* in the reliable supply equation i.e. intermittency.

Current examples of the emergence of energy storage systems in Australia can be found in remote communities e.g. King Island, Tasmania (advanced battery) and Denham, Western Australia (flywheel).

Storage technologies also have the potential to defer capital expenditure (for example, on new sub-stations), reduce operational costs through the displacement of diesel and diesel generators and redeem power quality losses.

Although energy storage systems, such as advanced batteries, are only just starting to materialise in Australia and the USA, they have been operating successfully in Japan (grid and non-grid applications) for the past decade.

The USA, while not as advanced in the application and installation of energy storage systems compared to Japan, is nevertheless at the forefront of advocating through recent *"Climate Change"* [1] and *"Net Zero Building"* [2] policies, the benefits of these technologies as one of the solutions towards an efficient energy infrastructure.

For any country, energy storage systems such as advanced batteries should also be viewed in terms of *Homeland Security* and other critical emergency type applications. These potential Stationary applications include *telecommunications, data centres and collocation sites, electronic manufacturing plants, hospitals and medical facilities, military installations, air traffic control, mining and offshore platform sites*.

Cost of Power Interruptions

Worldwide demand for energy is increasing, as are the incidents of 'blackouts' and 'brownouts' (reduced voltage but not complete electricity loss).

In a study [3] in February this year, the USA Government, through the Berkeley Lab, estimated the cost of power interruptions in the community as approximating $80Billion per annum, with 73% ($57 B) attributable to the commercial sector and 25% ($20B) to the industrial sector.

An important conclusion of this study was that momentary interruptions (also more frequent) have a greater impact on the cost of interruptions than the less frequent sustained interruptions.

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1. **November 2003** -*"Climate Change Technology Program"* –, Refer pages 1-3, 34-41, 87-89 highlighting advanced Batteries.[Ref: http://www.climatetechnology.gov/]

2. **May 2004 -** Announcement – *"N et Zero Buildings Policy USA Government"*
3. **February 2005** – Announcement – "Berkeley Lab Study Estimates $80Billion Annual Cost of Power Interruptions" http://www.lbl.gov/Science-Articles/Archive/EETD-power-interruptions.html

Another conclusion was that the lack of data on *power quality* meant that it could not estimate the costs of interruptions due to power quality problems.

Criticism previously voiced in Australia suggests that meaningful comparisons of the cost of generating electricity from different sources, including the cost of transmission to the end-user, are not available, thus giving support for the need to provide a more efficient system of data gathering in order to ascertain 'true costs'.

Over-Reliance on Large Grid Systems

While there have been practical reasons for establishing and maintaining large grid systems in the past, circumstances as already discussed, suggest that total reliance on these systems can have devastating effects as experience in the USA, Canada and European blackouts in 2003.

A recently released report titled *"Taming the Power Grid"* by V Madani & D. Novosei (refer http://www.spectrum.ieee.org/WEBONLY/wonews/jan05/0105grid.html) reflects the views of USA industry leaders and provides a number of practical options for mitigating the effects of grid congestions. Options for finding solutions include the use of power delivery technologies such as series capacitors, super-conducting materials, energy storage systems and micro-grids.

Australian Government Support for Energy Storage

One of the few governments globally, to recognise the value of Energy Storage is the Australian Government.

Under the 2004 Budget (see also the White Paper '*Securing Australia's Energy Future'* - *http://www.pmc.gov.au/publications/energy_future/index.htm*) the government allocated $20m to the development of energy storage systems for *"demonstrating technologies such as advanced batteries, electro-mechanical storage (e.g. flywheels) and chemical energy storage"*.

This is in addition to existing programs such as "*Renewable Energy Commercialisation"* and "*Renewable Remote Power Generation"* (diesel displacement in remote areas).

Summary

It is hoped the Productivity Commission's Inquiry can assist in addressing the range of options covering energy efficiency by including **Energy Storage** as a potential solution.

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